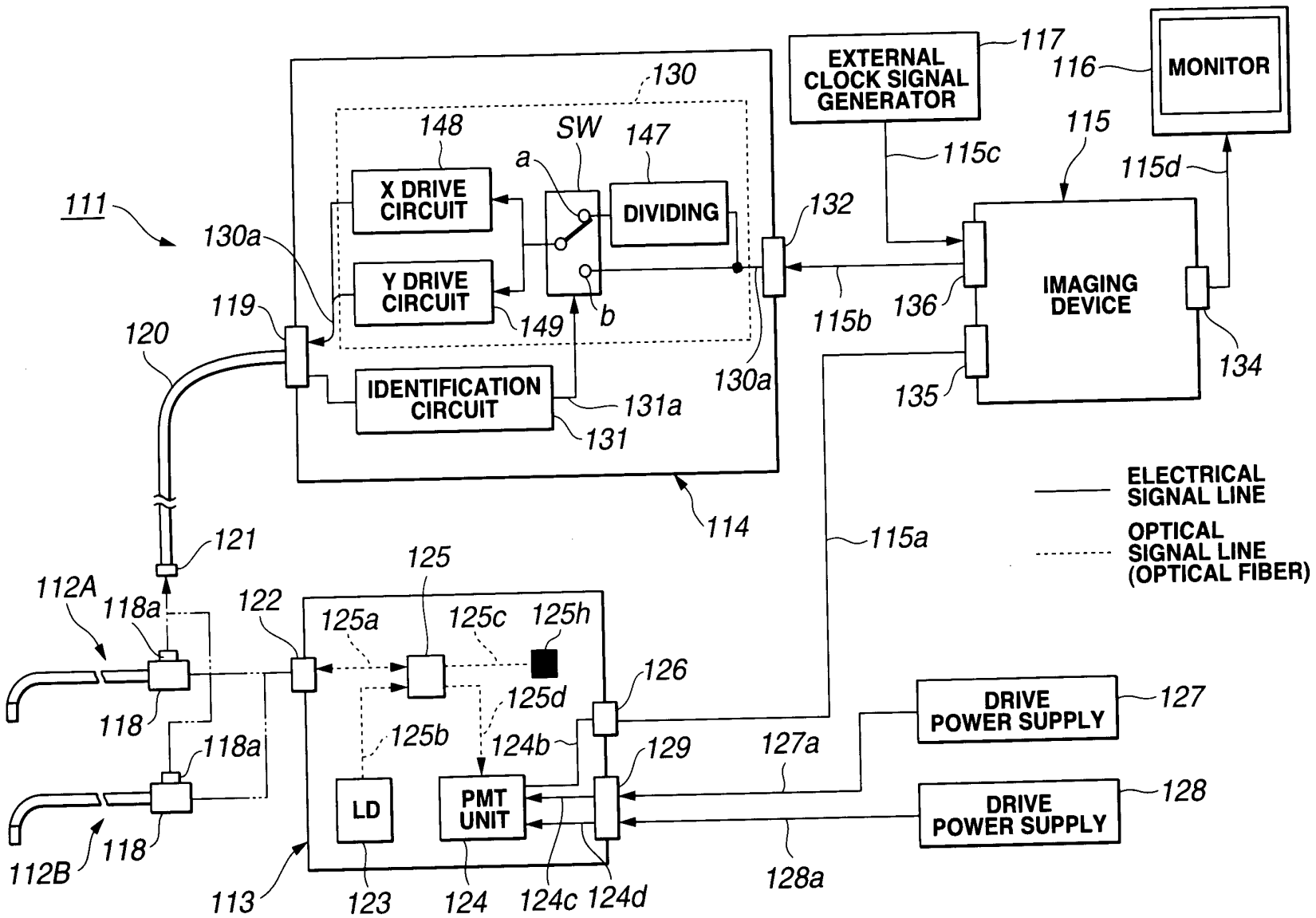
FIG.1



09/857614

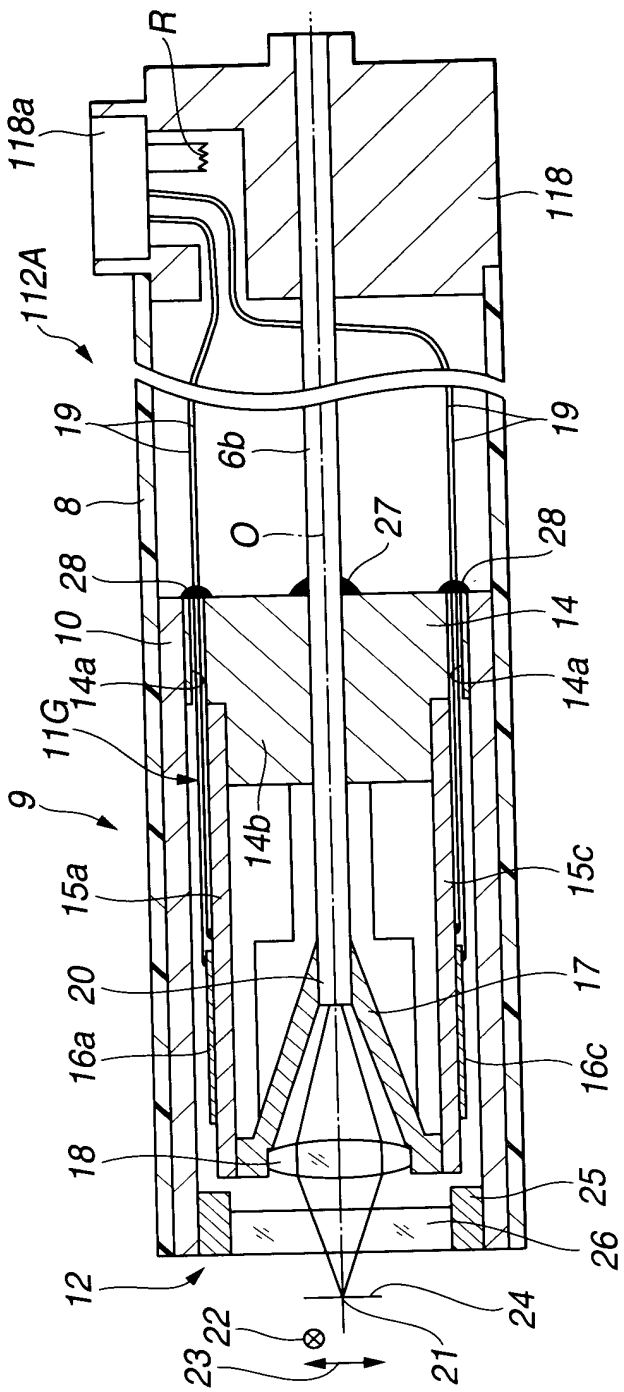

R
118a
118
112A
19
6b
O
27
8
28
10
14a
11G
9
14b
15a
15c
20
17
16a
16c
18
25
26
12
24
22
23
21

FIG.2

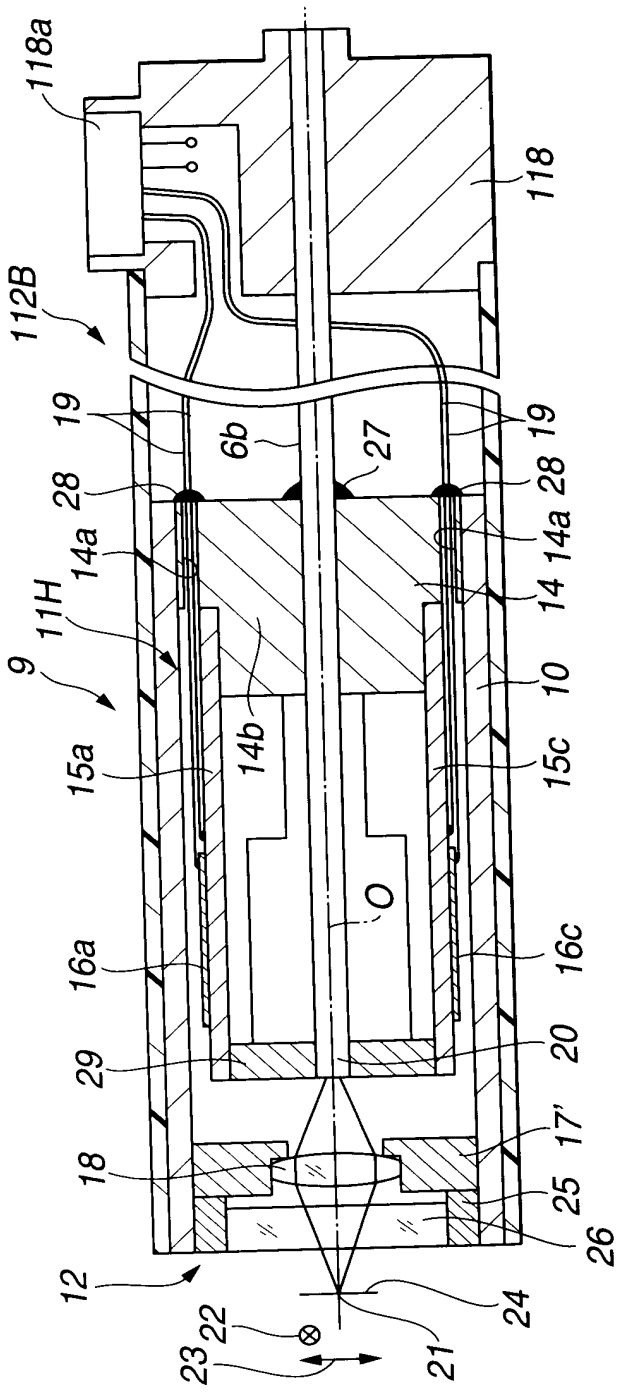

118a
118
112B
19
6b
27
28
14a
11H
9
14
14b
15a
10
15c
O
16a
16c
29
20
17'
18
25
26
12
24
22
23
21

FIG.4

FIG.3

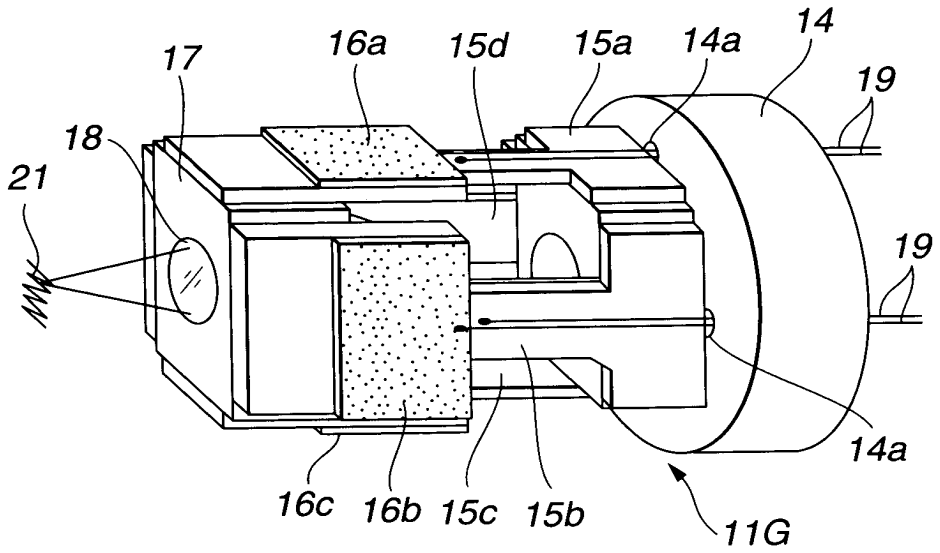

17
16a
15d
15a
14a
14
19
18
21
19
14a
16c
16b
15c
15b
11G

FIG.5

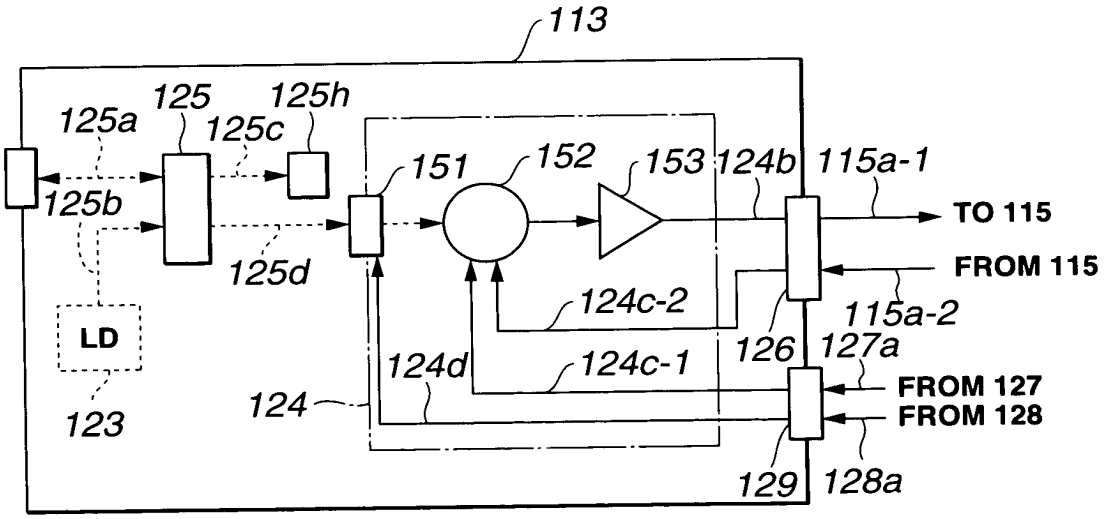
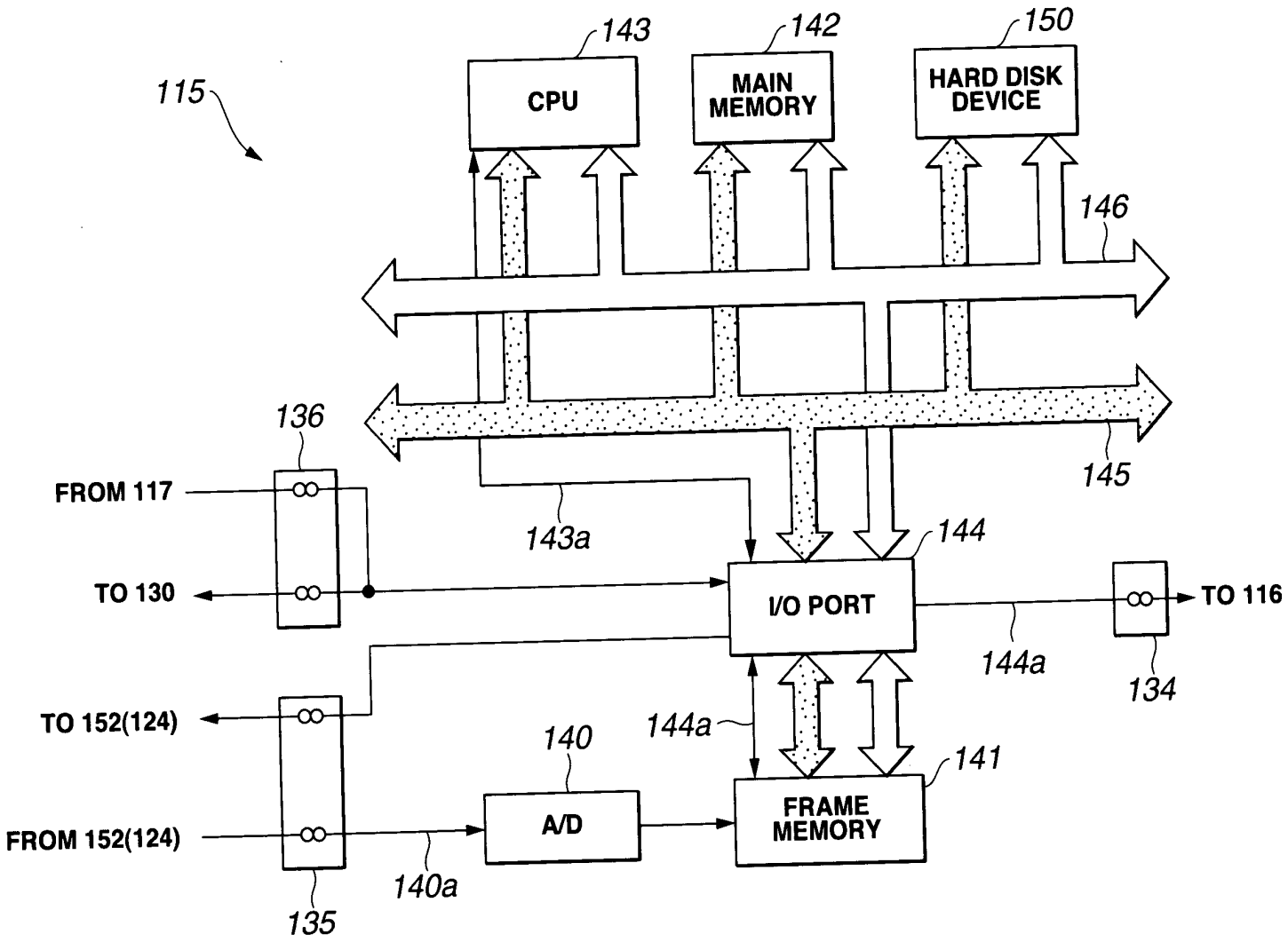

113
125a
125
125h
125c
125b
125d
151
152
153
124b
115a-1
TO 115
FROM 115
115a-2
LD
123
124
124d
124c-1
124c-2
126
127a
FROM 127
FROM 128
129
128a

FIG.6



09/857614

FIG.7A

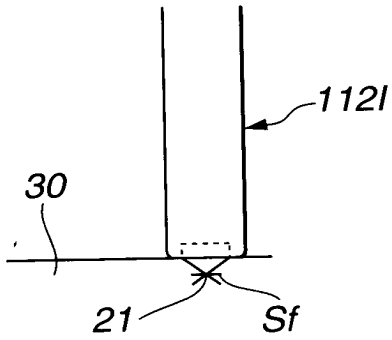


FIG.7B

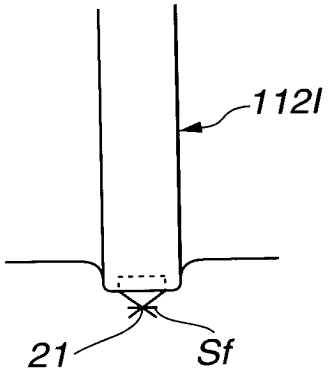


FIG.7C

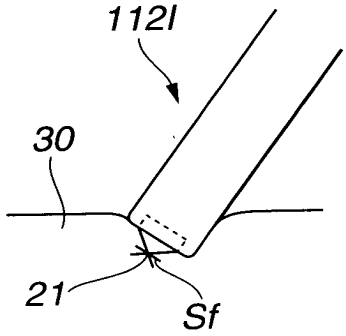


FIG.7D

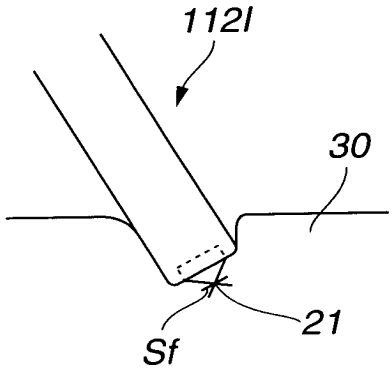


FIG.8

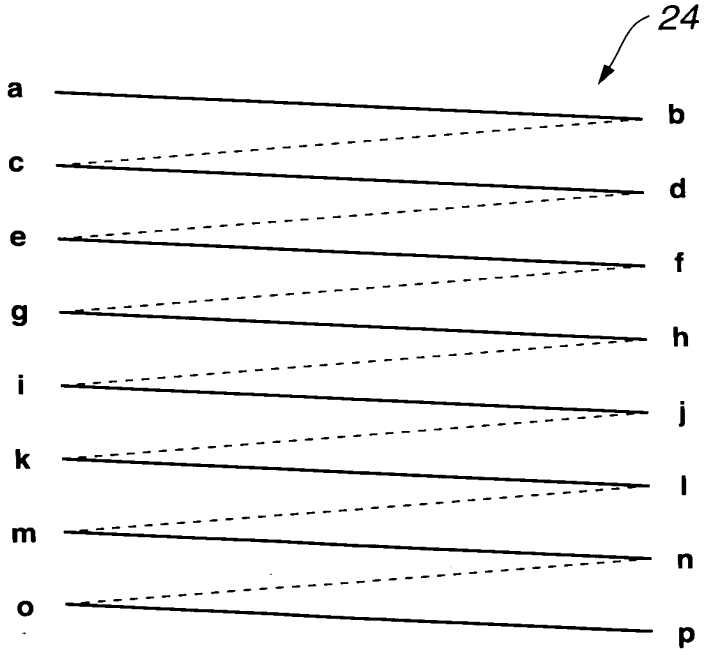


FIG.9A

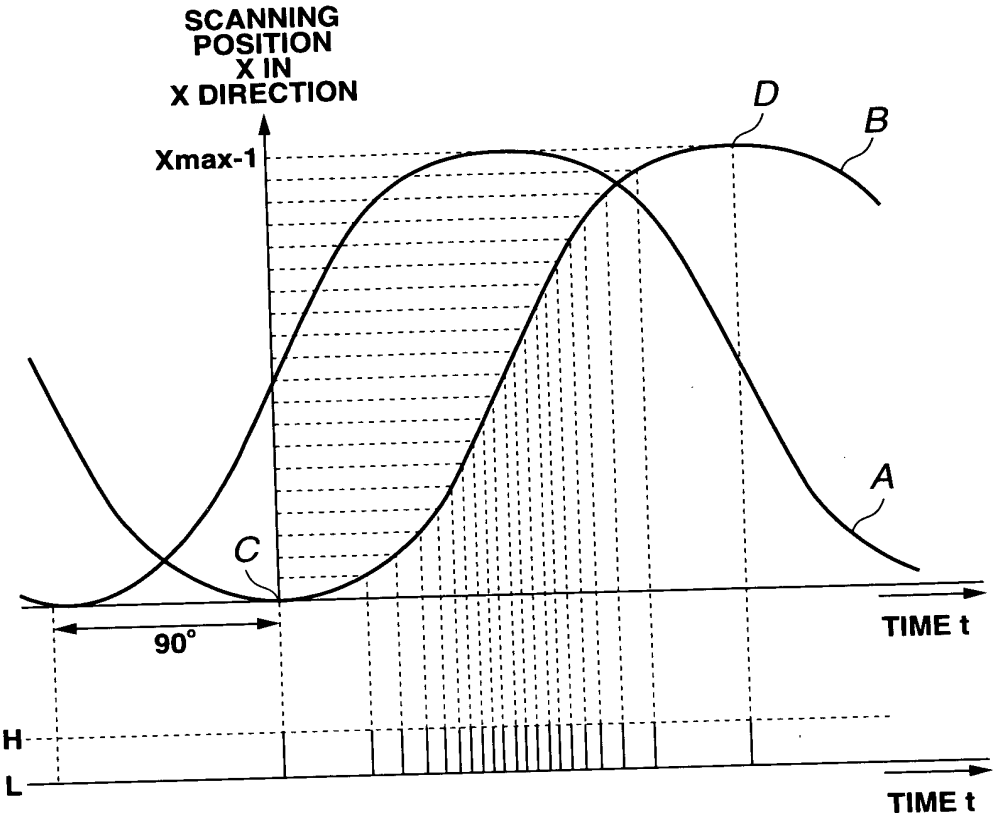


FIG.9B

FIG.9C

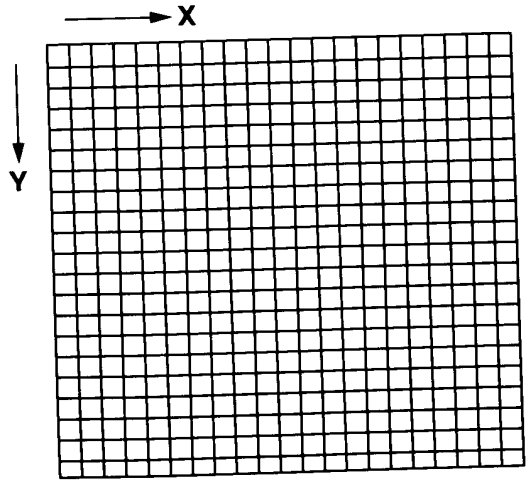


FIG.10

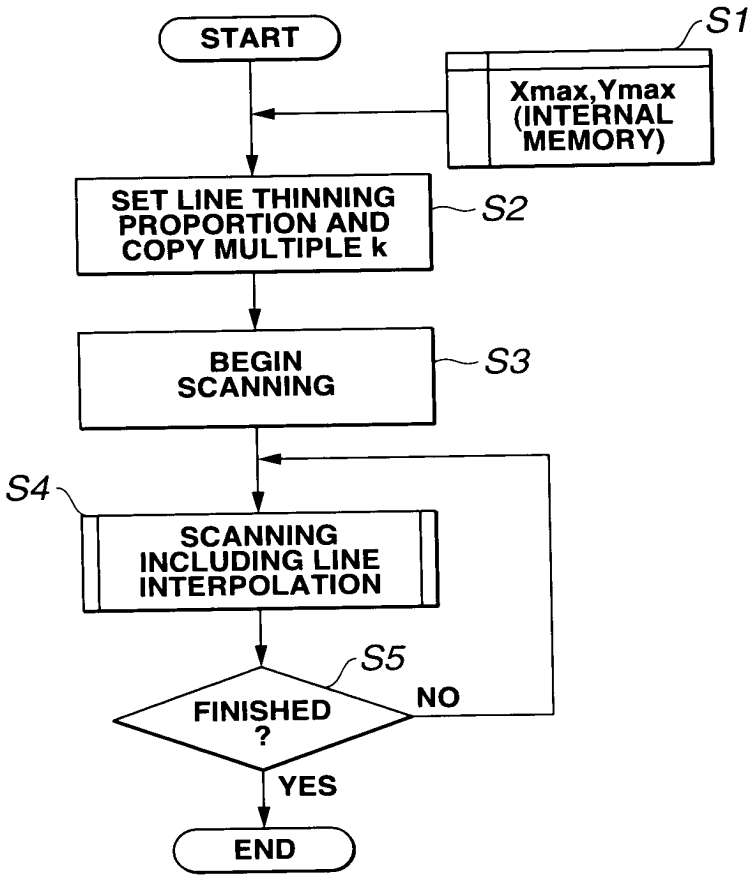

START
S1
Xmax,Ymax (INTERNAL MEMORY)
SET LINE THINNING PROPORTION AND COPY MULTIPLE k
S2
BEGIN SCANNING
S3
S4
SCANNING INCLUDING LINE INTERPOLATION
S5
FINISHED ?
NO
YES
END

FIG.11

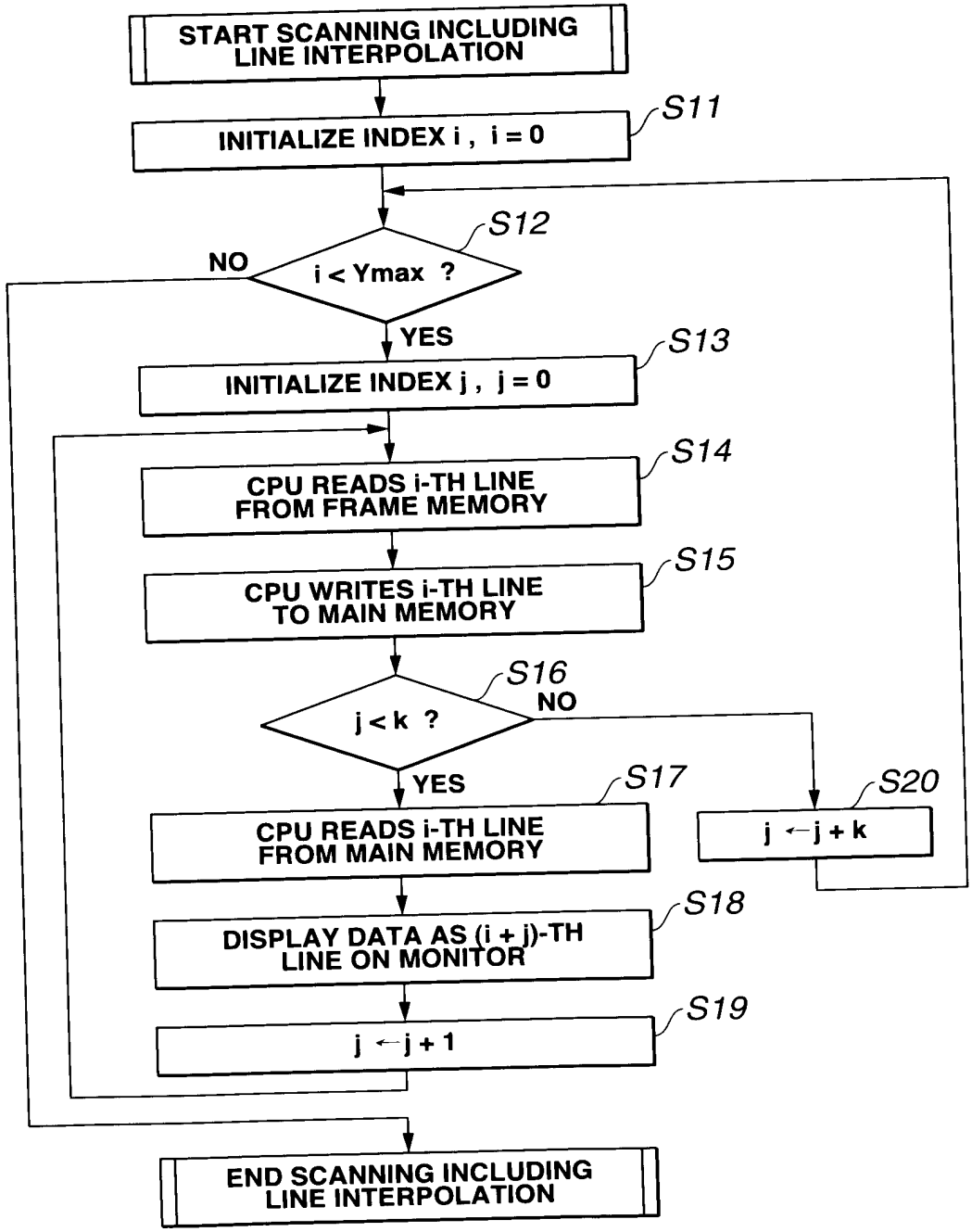

START SCANNING INCLUDING LINE INTERPOLATION
INITIALIZE INDEX i , i = 0
S11
S12
NO
i < Ymax ?
YES
INITIALIZE INDEX j , j = 0
S13
CPU READS i-TH LINE FROM FRAME MEMORY
S14
CPU WRITES i-TH LINE TO MAIN MEMORY
S15
S16
j < k ?
NO
YES
S17
CPU READS i-TH LINE FROM MAIN MEMORY
S20
j ← j + k
DISPLAY DATA AS (i + j)-TH LINE ON MONITOR
S18
j ← j + 1
S19
END SCANNING INCLUDING LINE INTERPOLATION

FIG.12A

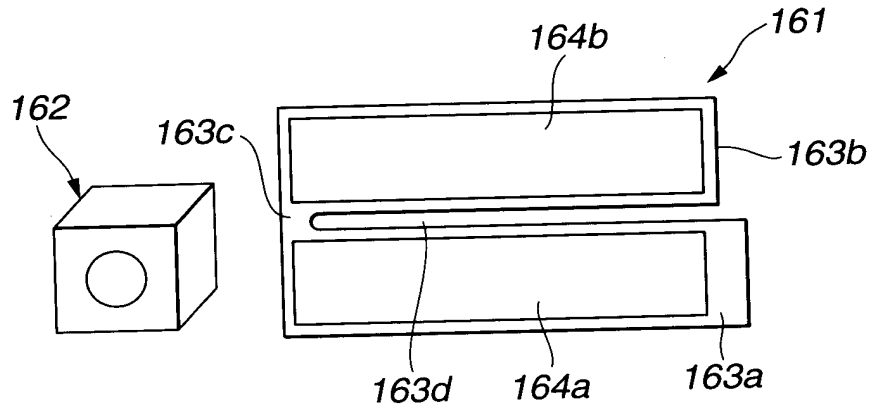


FIG.12D

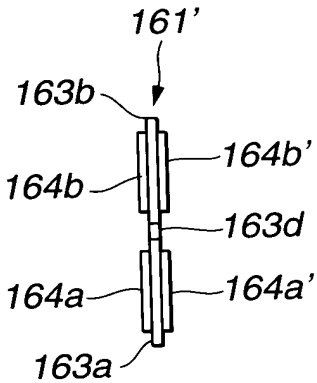


FIG.12B

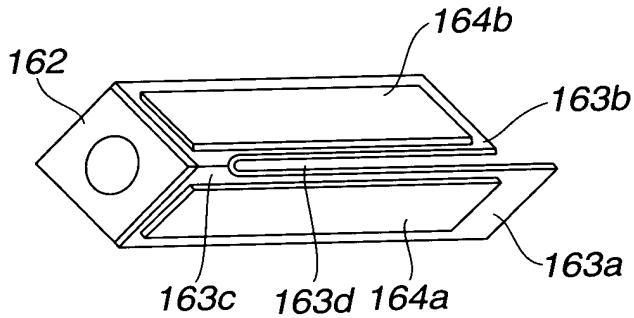


FIG.12C

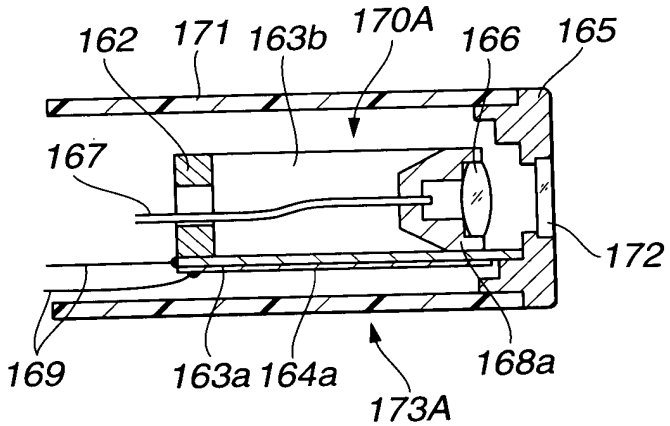


FIG.13

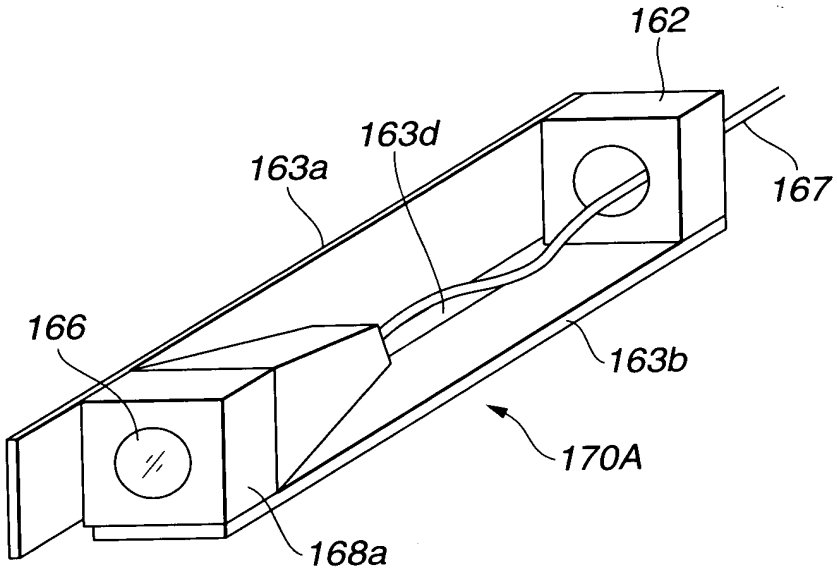

162
163d
163a
167
166
163b
170A
168a

FIG.14

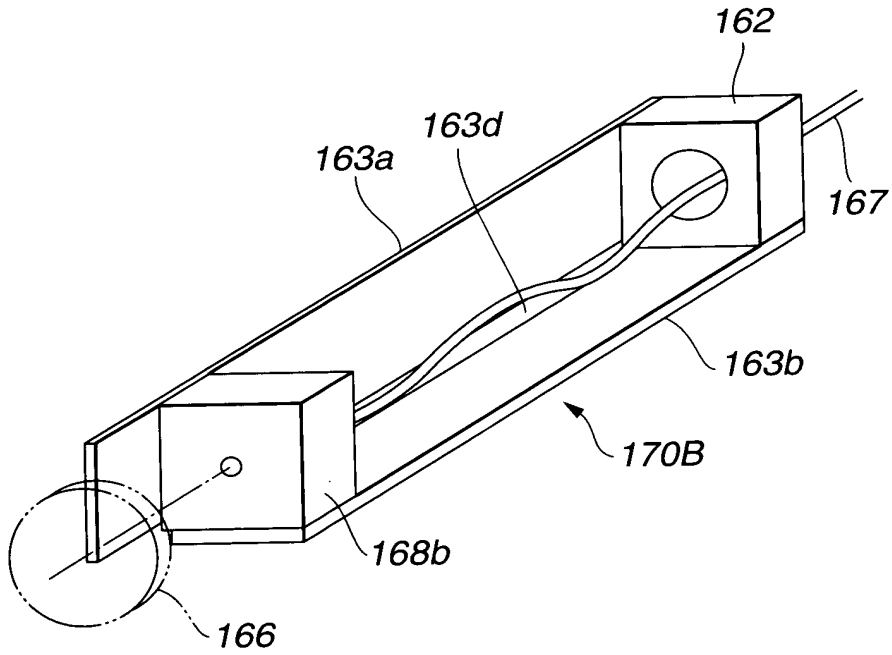

162
163d
163a
167
163b
170B
168b
166

FIG.15

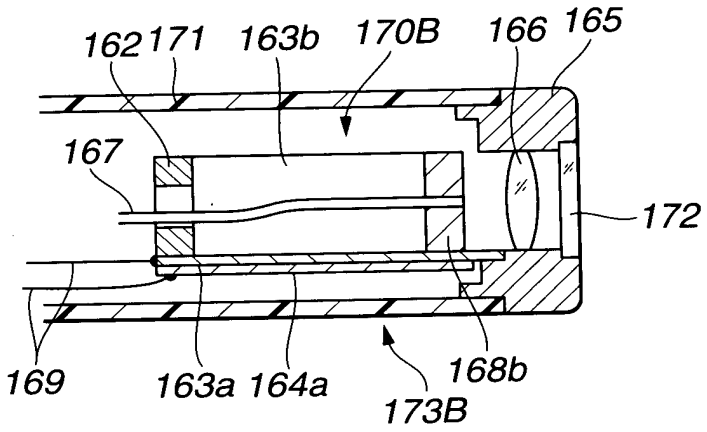


FIG.16

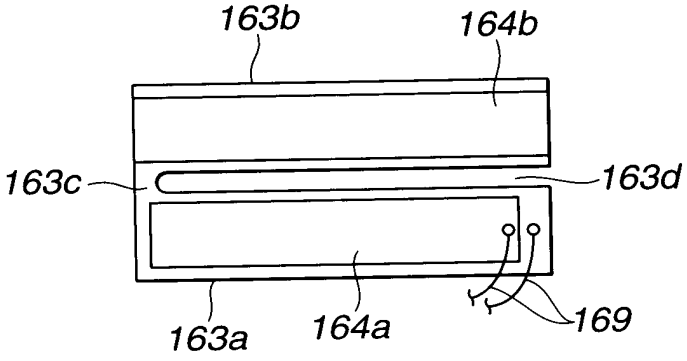


FIG.17

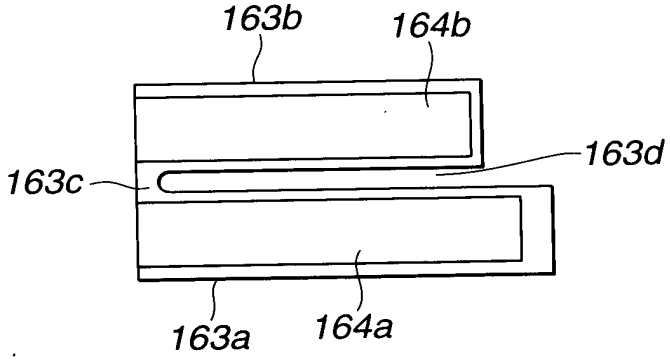


FIG.18A

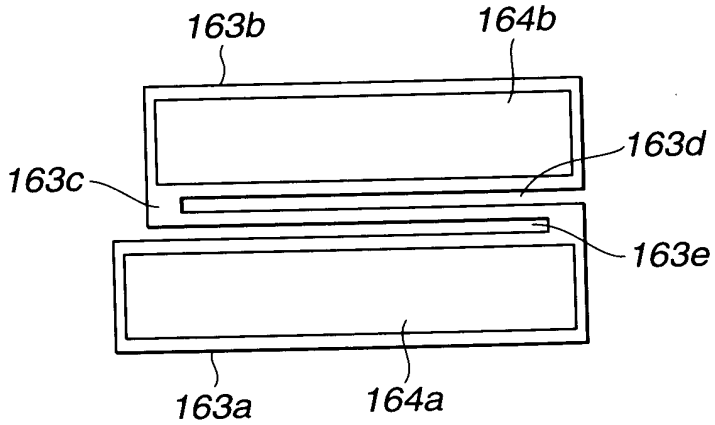


FIG.18B

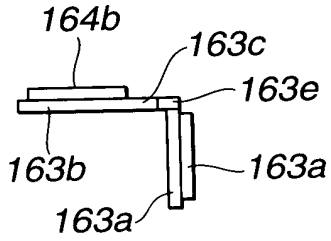
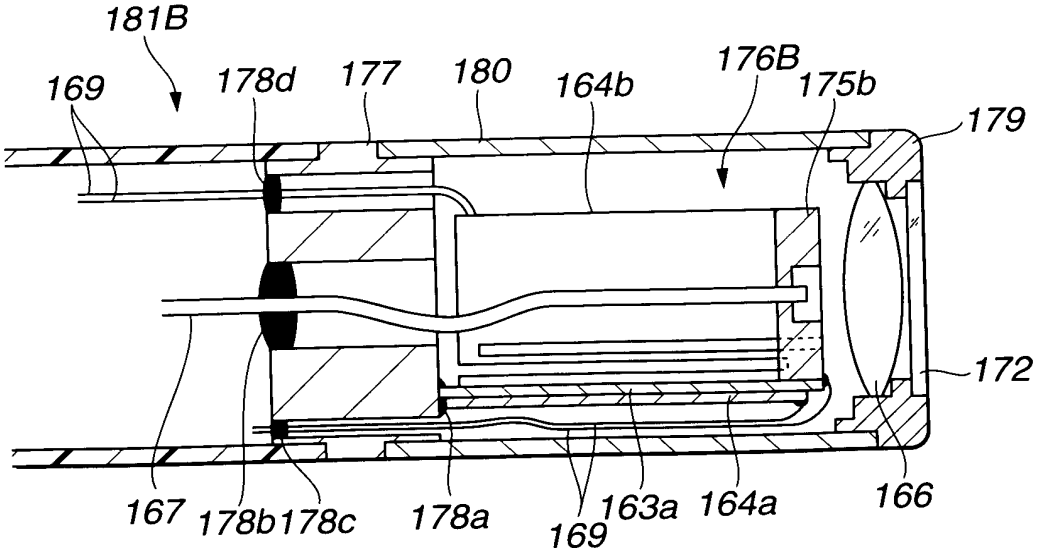


FIG.19



09785761 4

FIG.20

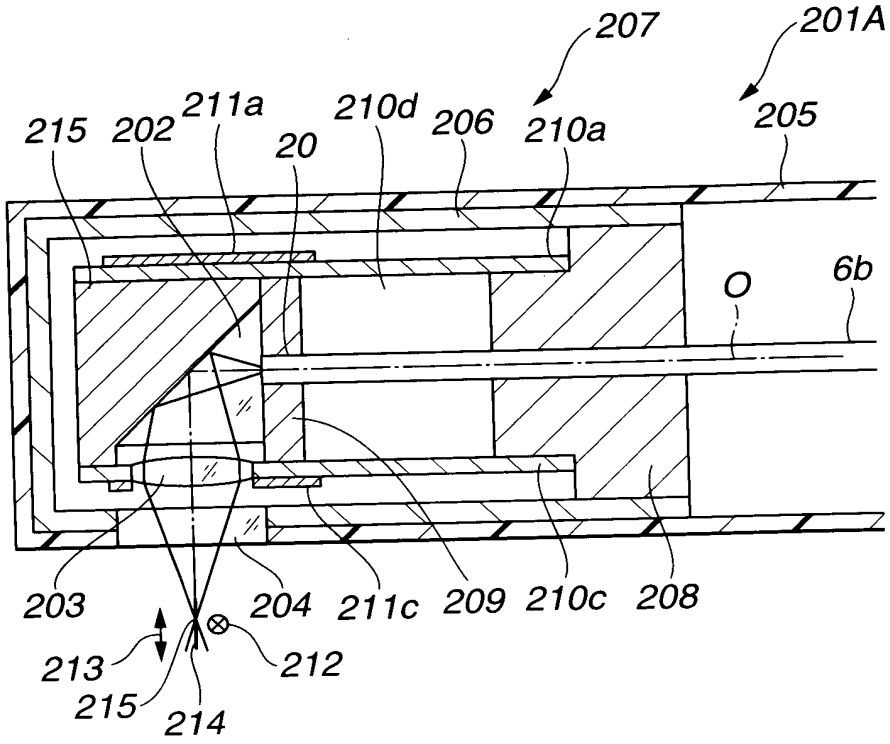


FIG.21

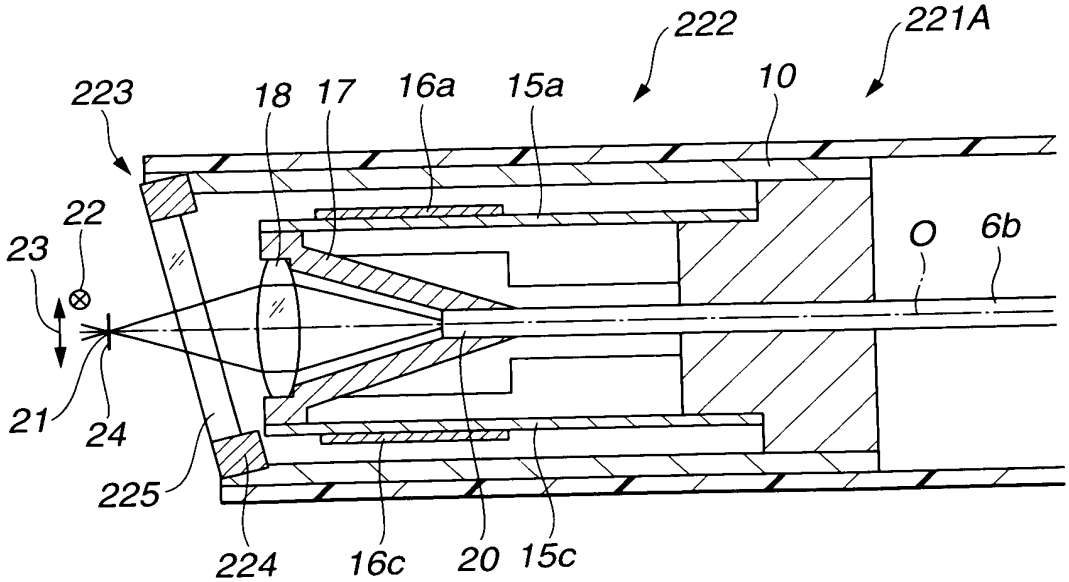


FIG.22

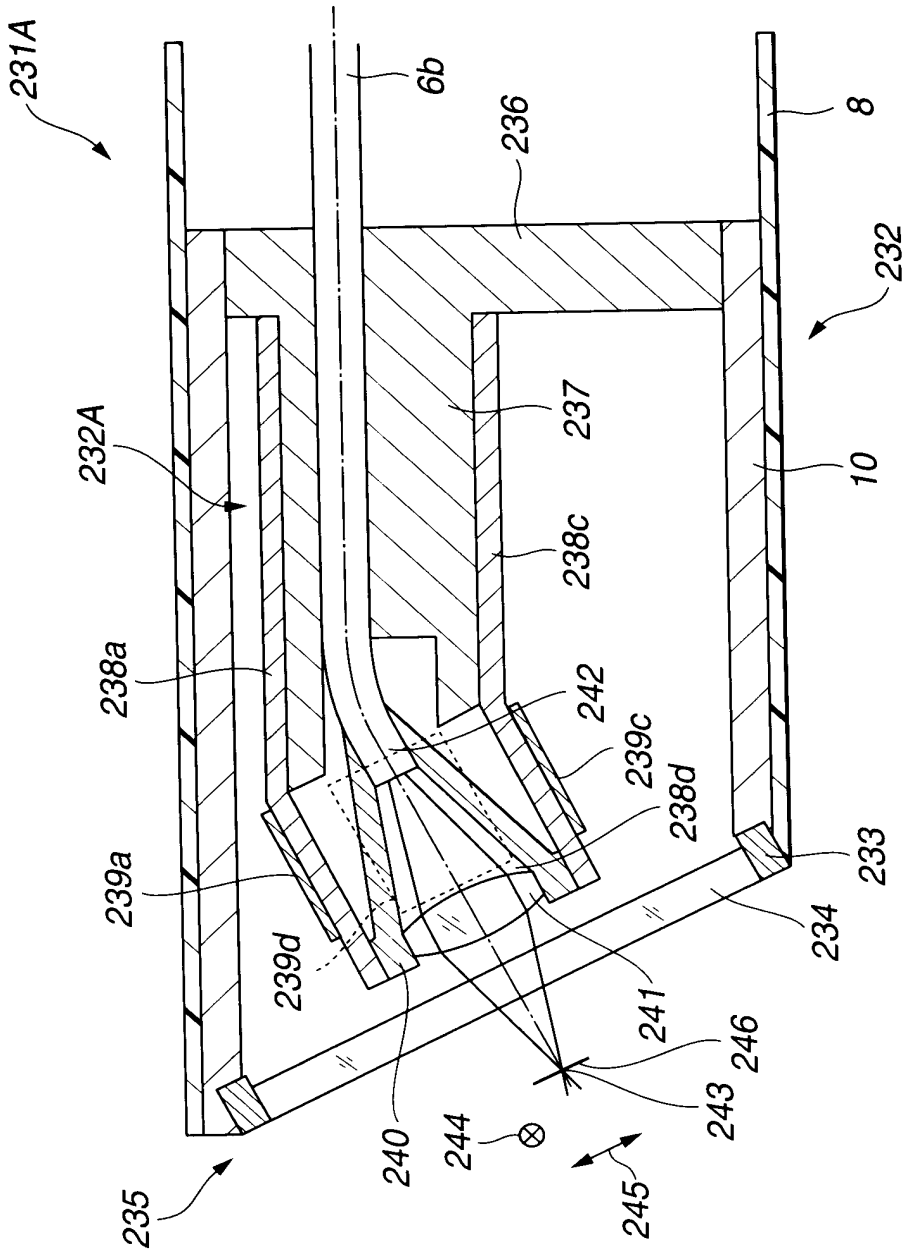
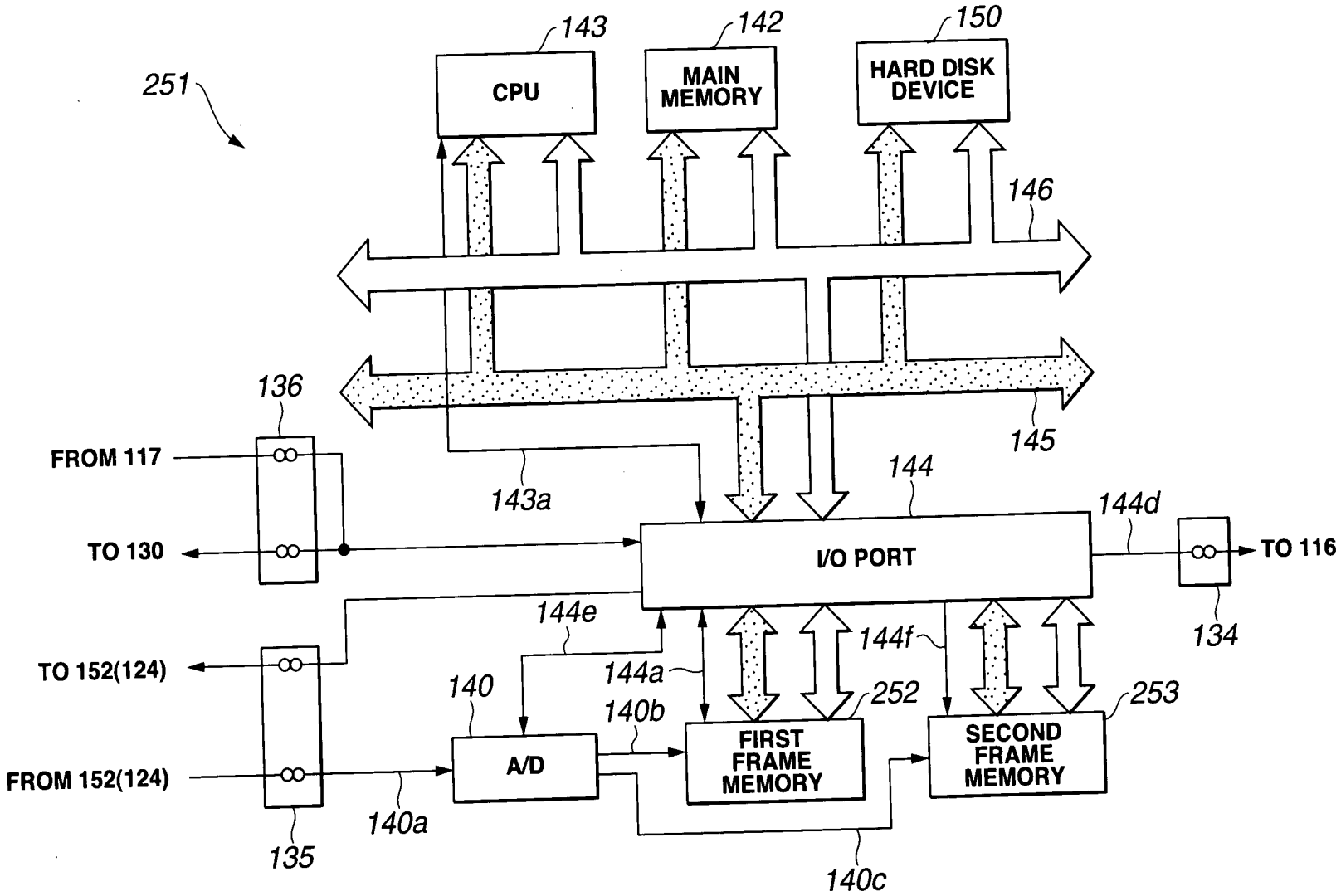

231A
6b
236
8
232
232A
237
10
238c
238a
242
239c
238d
239a
233
239d
234
241
246
243
240
244
245
235

FIG.23


251
143
CPU
142
MAIN MEMORY
150
HARD DISK DEVICE
146
145
136
FROM 117
TO 130
143a
144
144d
I/O PORT
TO 116
134
144e
144f
TO 152(124)
144a
140
140b
252
253
FIRST FRAME MEMORY
SECOND FRAME MEMORY
A/D
FROM 152(124)
140a
135
140c

09857614 09/857614

FIG.24A

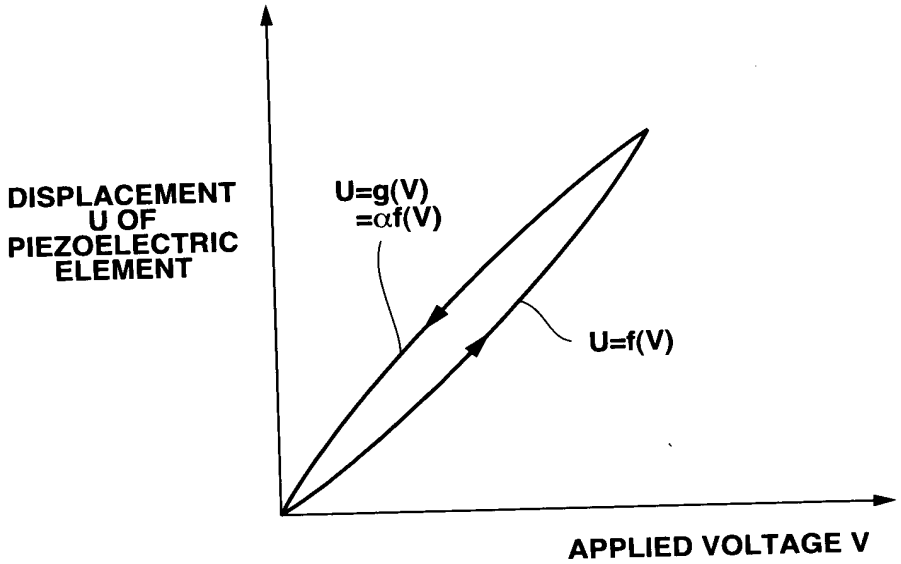


FIG.24B

APPLIED VOLTAGE V	DISPLACEMENT OF FORWARD PATH U(=f(V))	CORRECTION COEFFICIENT α	DISPLACEMENT OF BACKWARD PATH U(=αf(V))
⋮	⋮	⋮	⋮

FIG.25

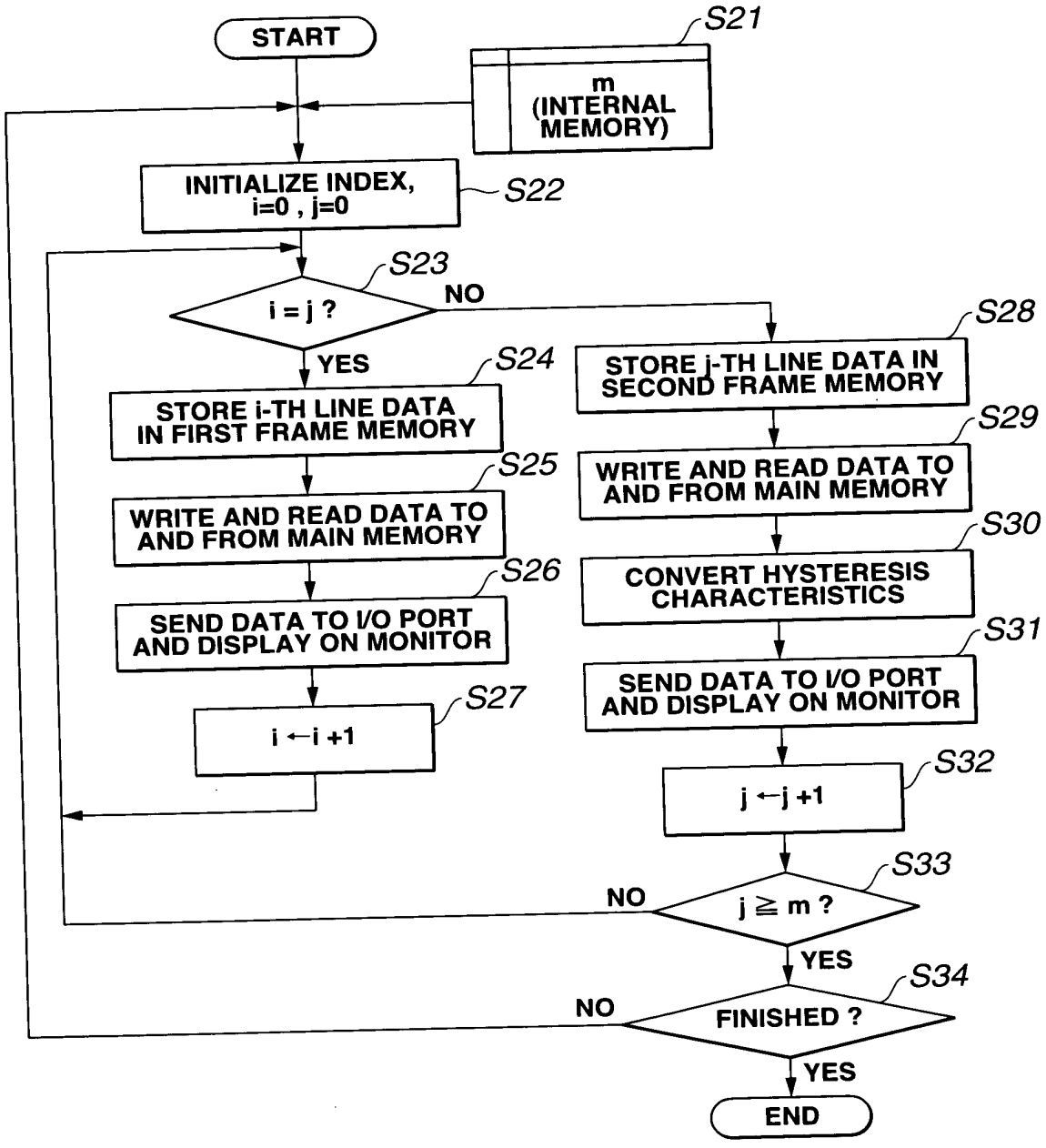

START
S21
m
(INTERNAL
MEMORY)
INITIALIZE INDEX,
i=0 , j=0
S22
S23
i = j ?
NO
YES
S24
STORE i-TH LINE DATA
IN FIRST FRAME MEMORY
S25
WRITE AND READ DATA TO
AND FROM MAIN MEMORY
S26
SEND DATA TO I/O PORT
AND DISPLAY ON MONITOR
S27
i ← i +1
S28
STORE j-TH LINE DATA IN
SECOND FRAME MEMORY
S29
WRITE AND READ DATA TO
AND FROM MAIN MEMORY
S30
CONVERT HYSTERESIS
CHARACTERISTICS
S31
SEND DATA TO I/O PORT
AND DISPLAY ON MONITOR
S32
j ← j +1
S33
NO
j ≧ m ?
YES
S34
NO
FINISHED ?
YES
END

FIG.26

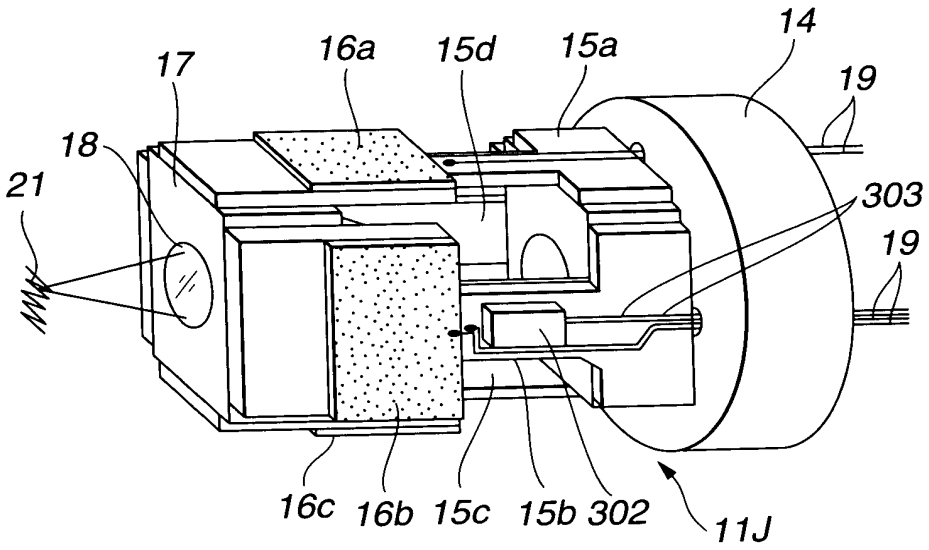

17
16a
15d
15a
14
19
18
21
303
19
16c
16b
15c
15b
302
11J

FIG.27

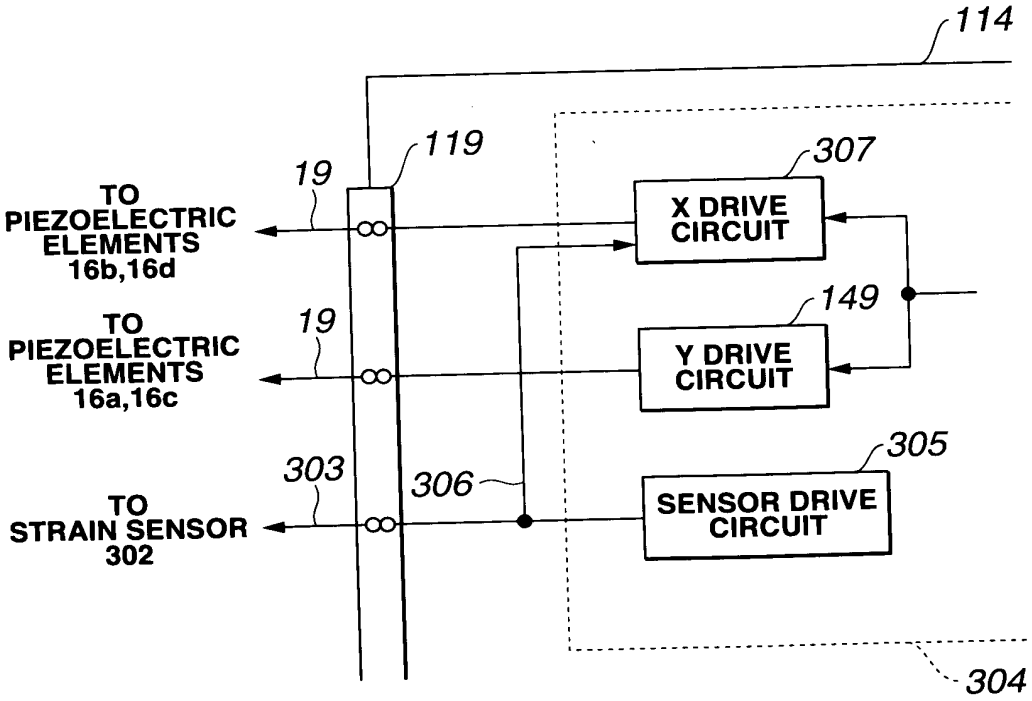

114
119
19
307
TO PIEZOELECTRIC ELEMENTS 16b,16d
X DRIVE CIRCUIT
149
19
TO PIEZOELECTRIC ELEMENTS 16a,16c
Y DRIVE CIRCUIT
305
303
306
TO STRAIN SENSOR 302
SENSOR DRIVE CIRCUIT
304

FIG.28

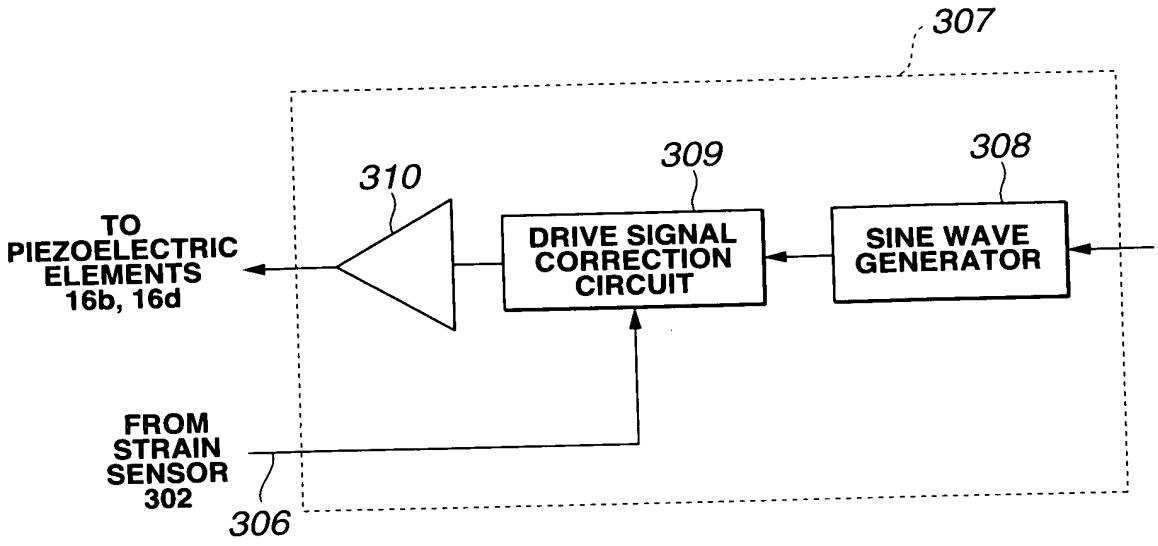


FIG.29A

SINE WAVE OUTPUT

FIG.29B

SENSOR OUTPUT

FIG.29C

CORRECTION SIGNAL OUTPUT

FIG.29D

SENSOR OUTPUT

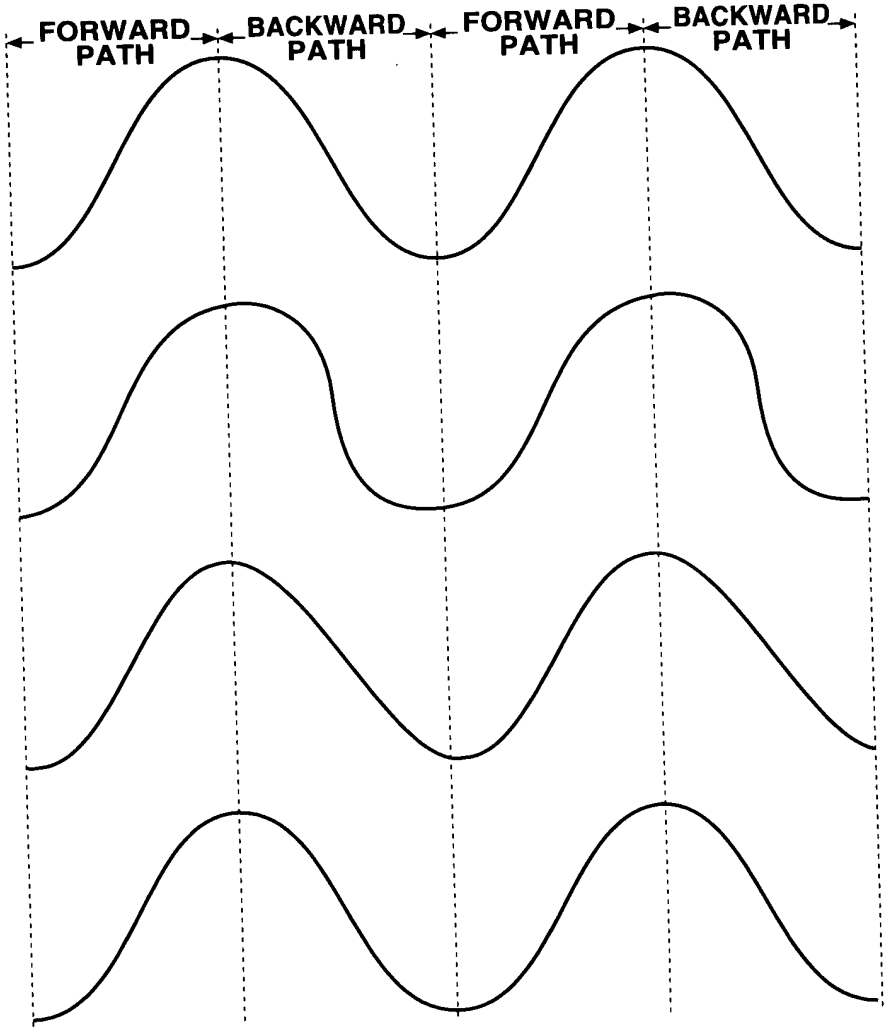


FIG.30

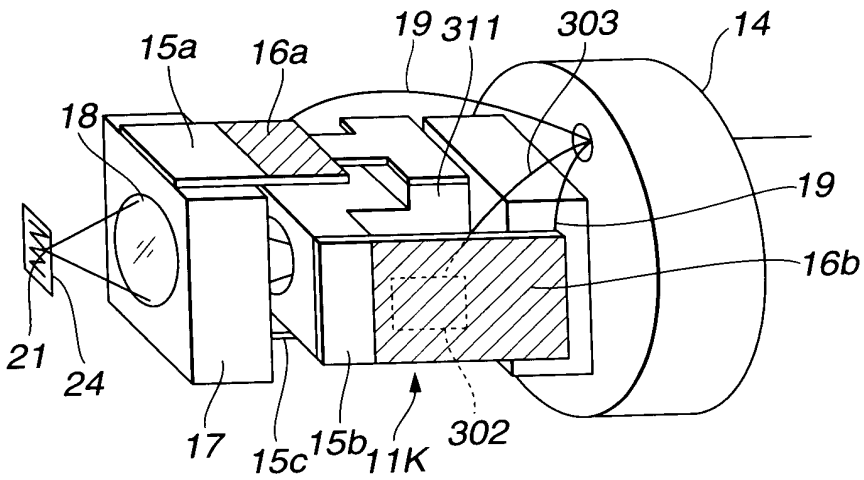


FIG.31

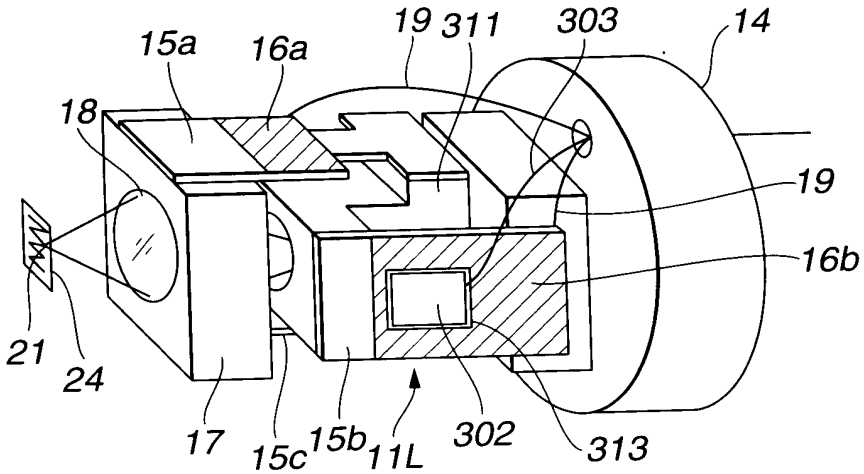


FIG.32

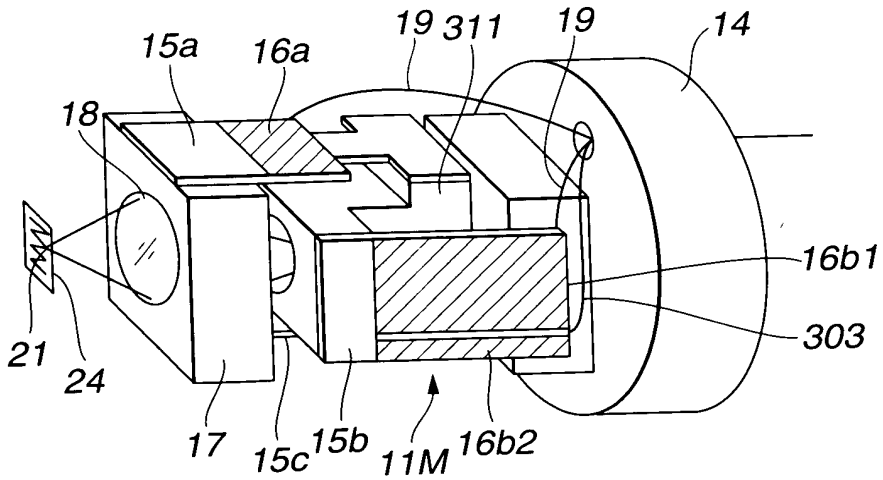


FIG.33

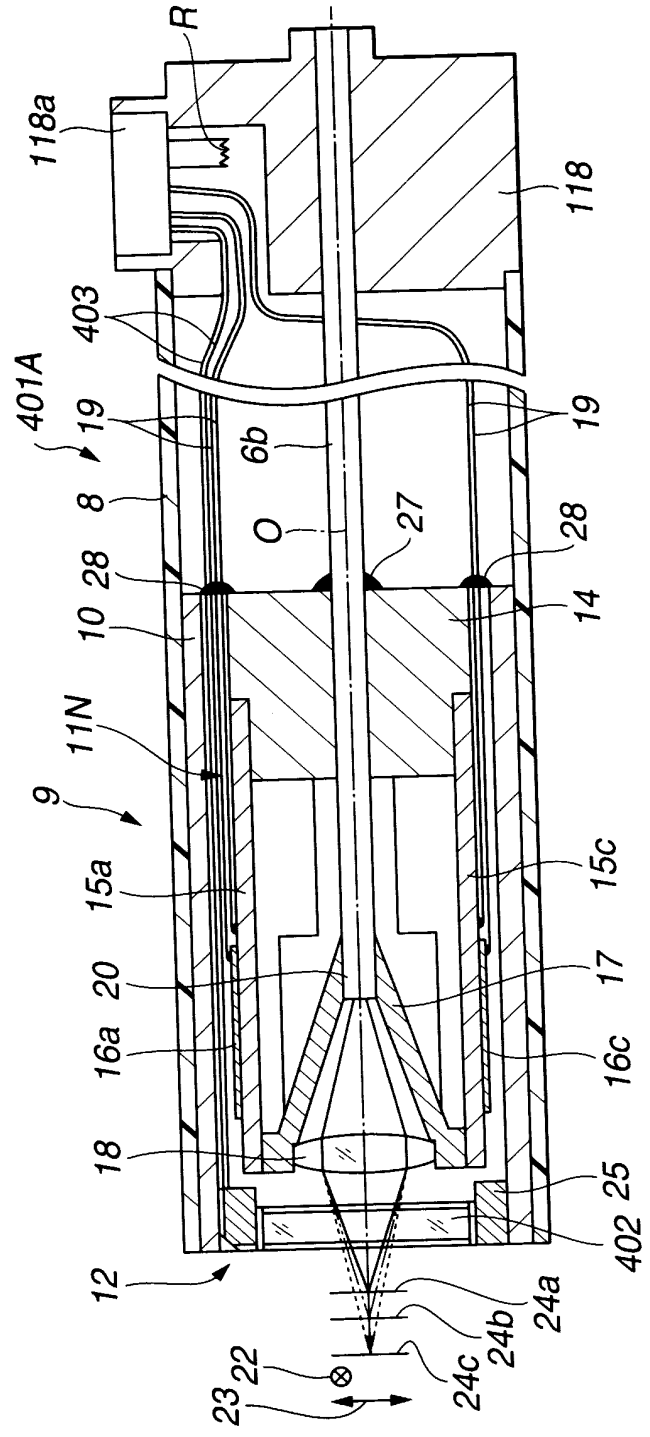

R
118a
118
403
401A
19
6b
8
O
27
28
10
14
11N
9
15a
15c
20
17
16a
16c
18
25
402
12
24a
24b
24c
22
23

FIG.34

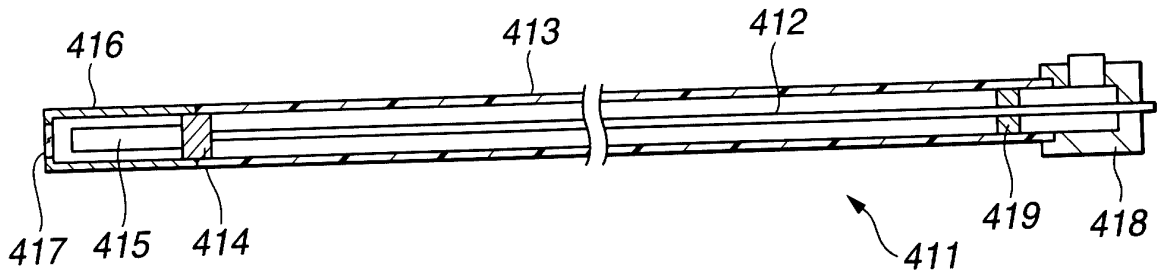
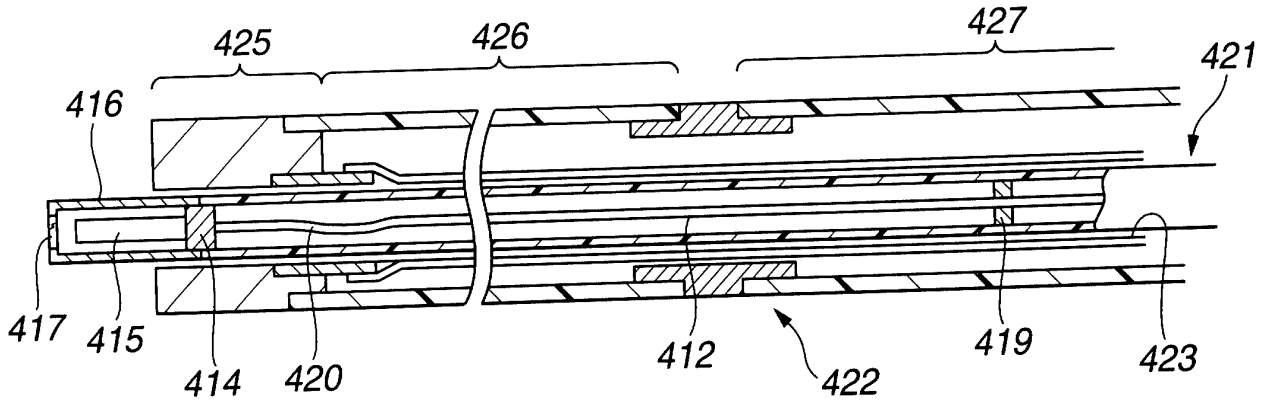


FIG.35



09/857614 05/25/01 09:54:05

09857614.060601
09/857614

FIG.36

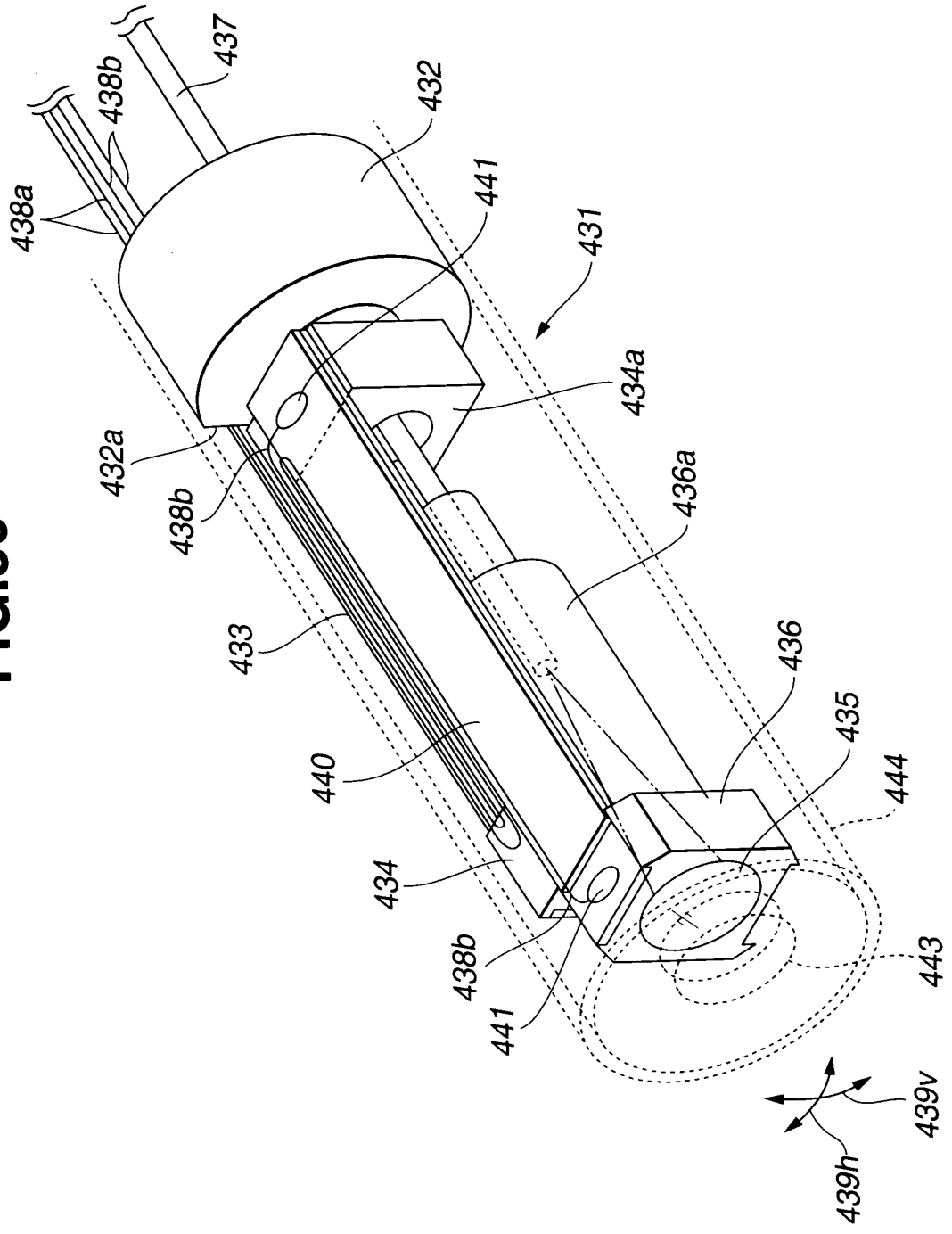


FIG.37

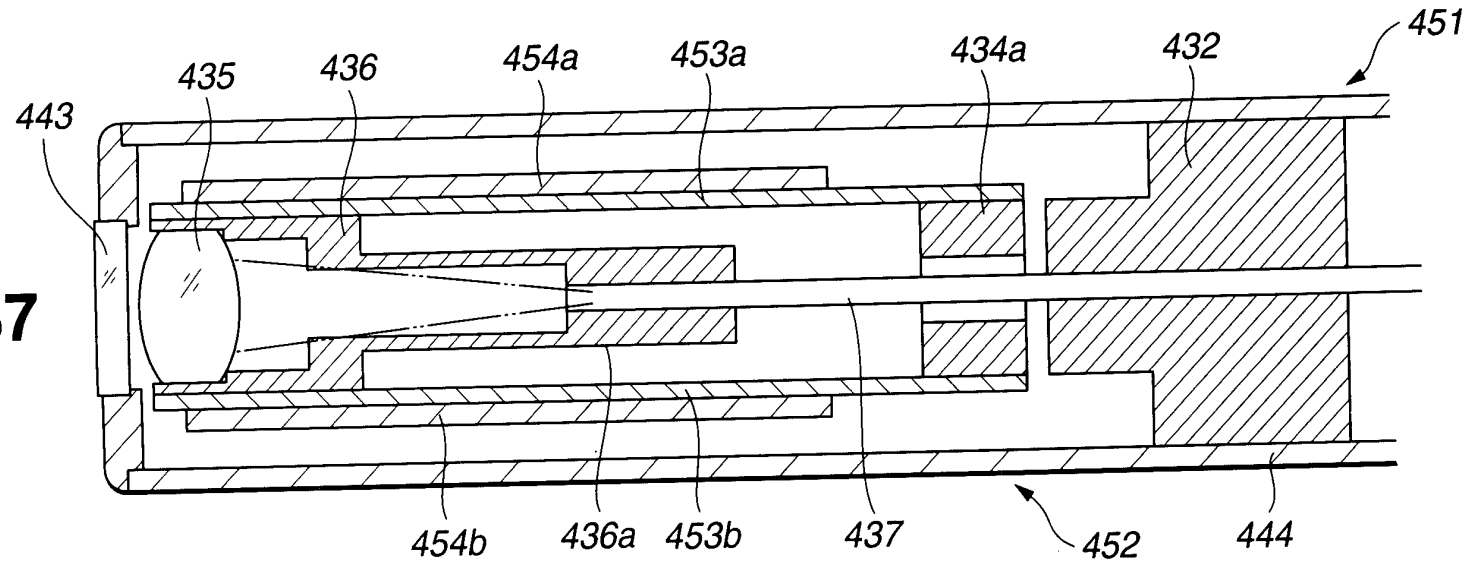
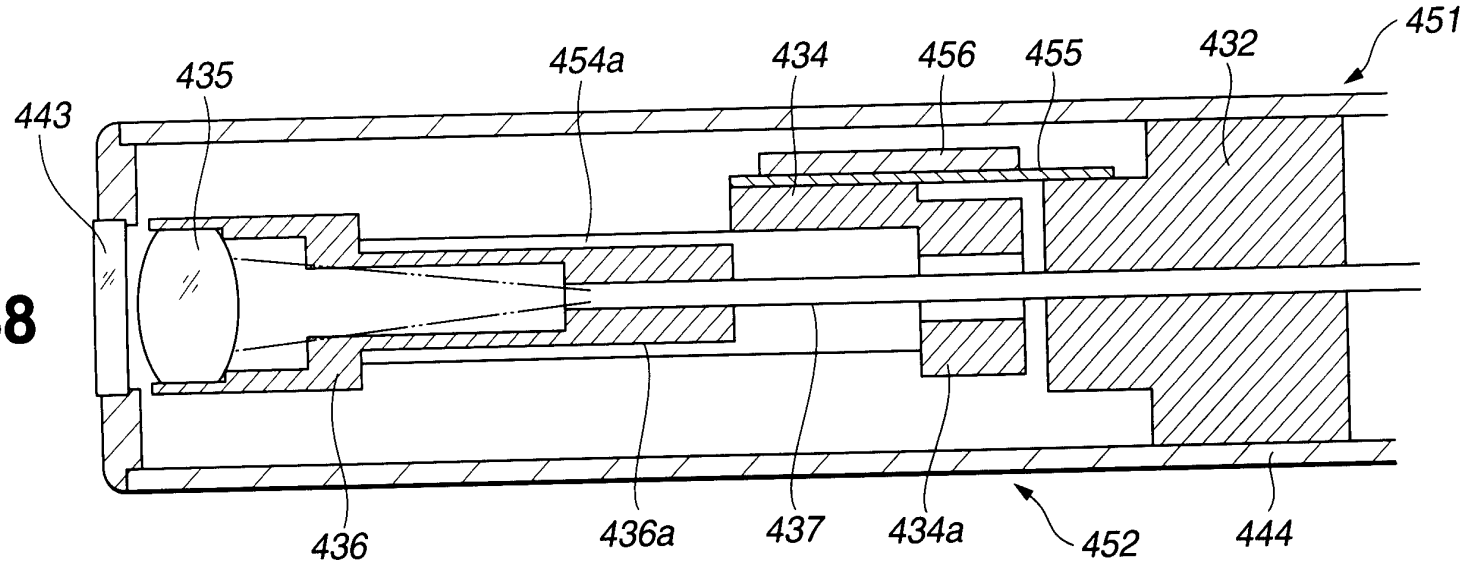


FIG.38



09/857614

FIG.39

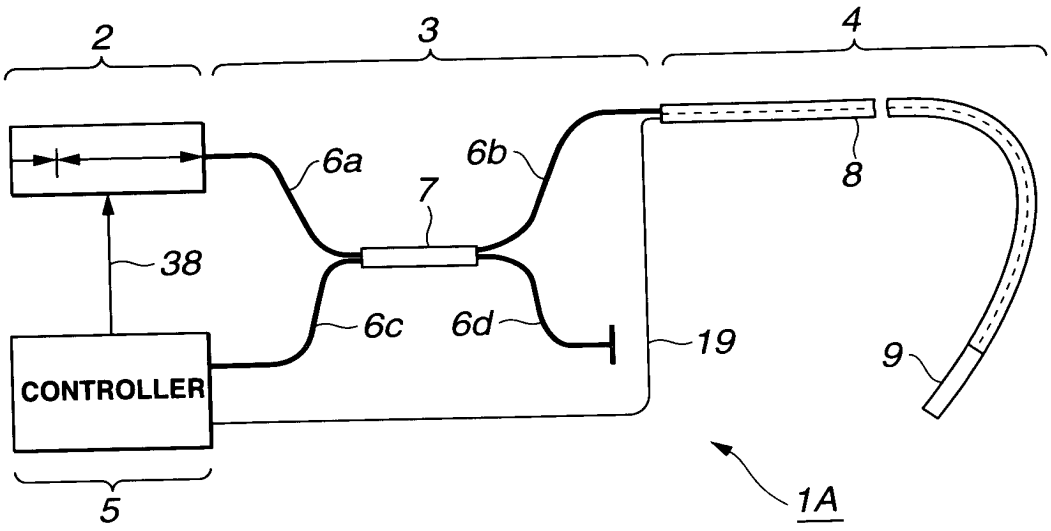
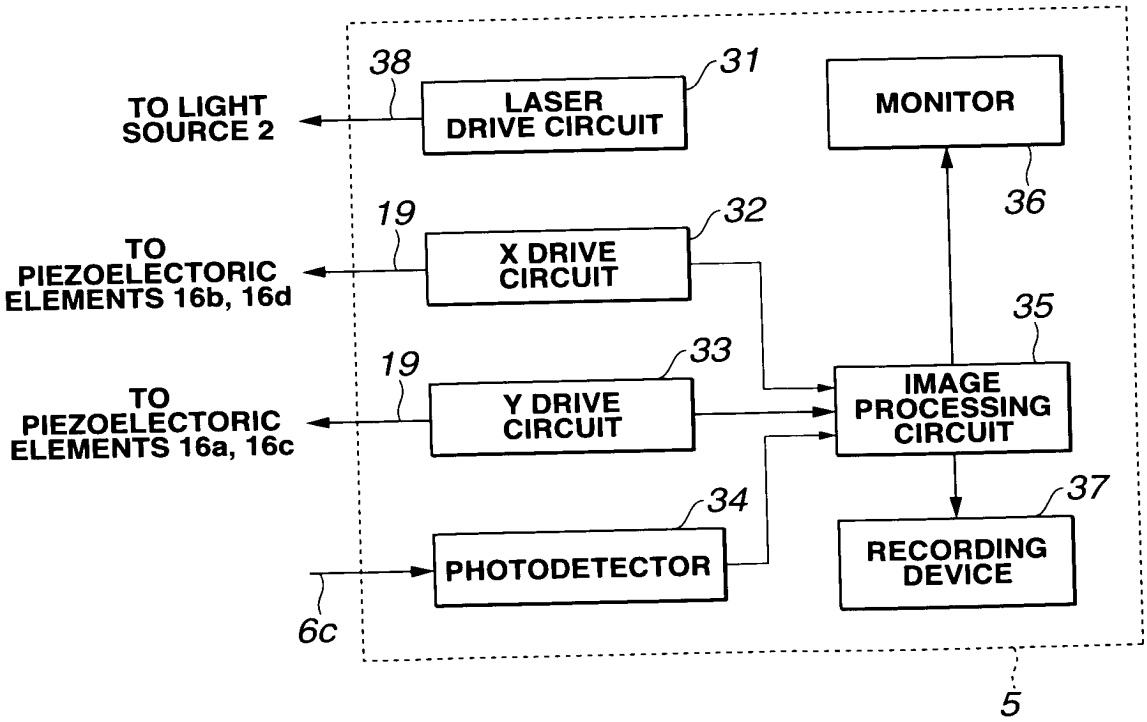

2
3
4
6a
6b
7
8
38
6c
6d
19
9
CONTROLLER
5
1A

FIG.42


38
31
TO LIGHT SOURCE 2
LASER DRIVE CIRCUIT
MONITOR
36
19
32
TO PIEZOELECTORIC ELEMENTS 16b, 16d
X DRIVE CIRCUIT
35
19
33
TO PIEZOELECTORIC ELEMENTS 16a, 16c
Y DRIVE CIRCUIT
IMAGE PROCESSING CIRCUIT
34
37
PHOTODETECTOR
RECORDING DEVICE
6c
5

09857614.060601
09/857614

FIG.40

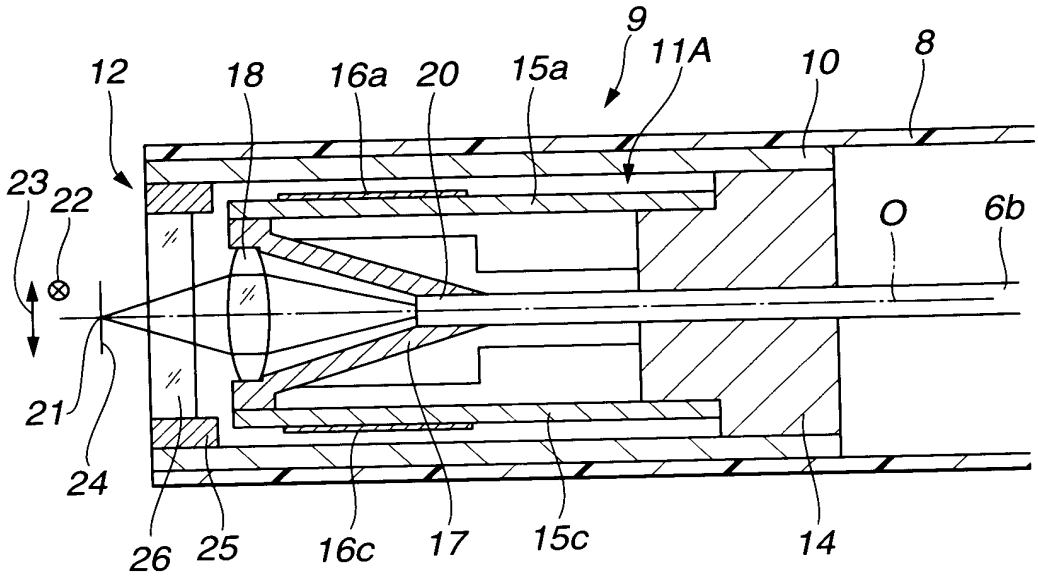


FIG.41

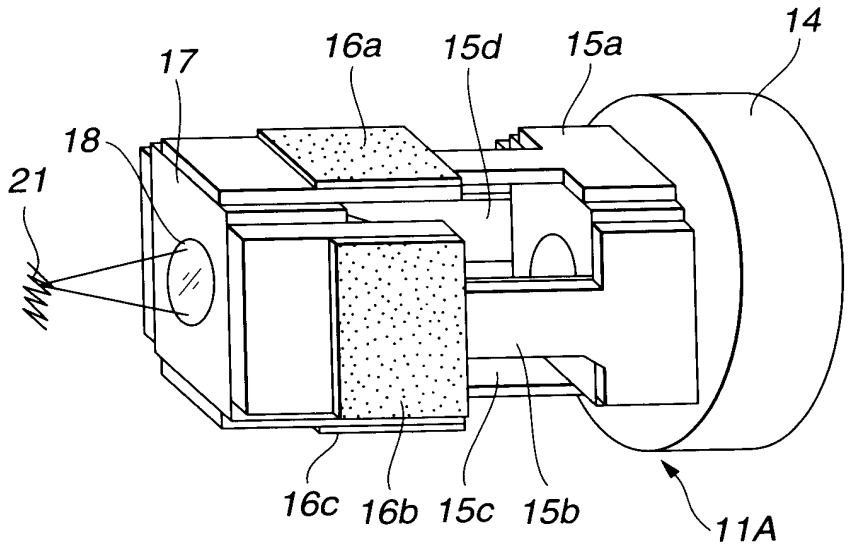


FIG.43

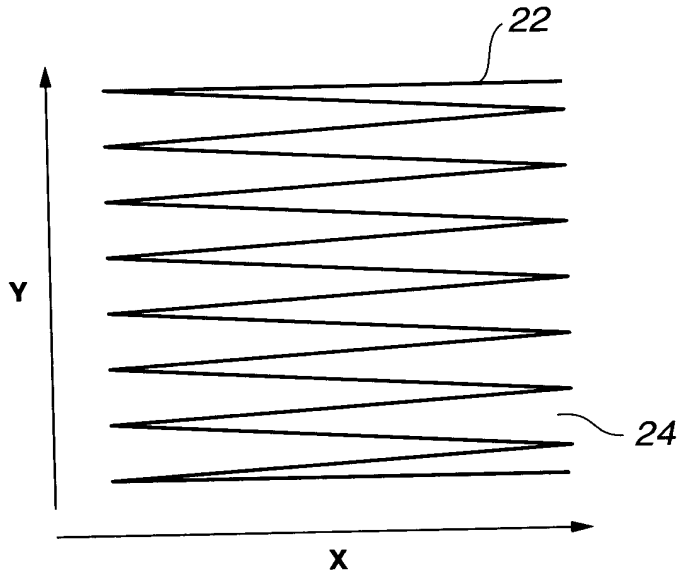


FIG.44

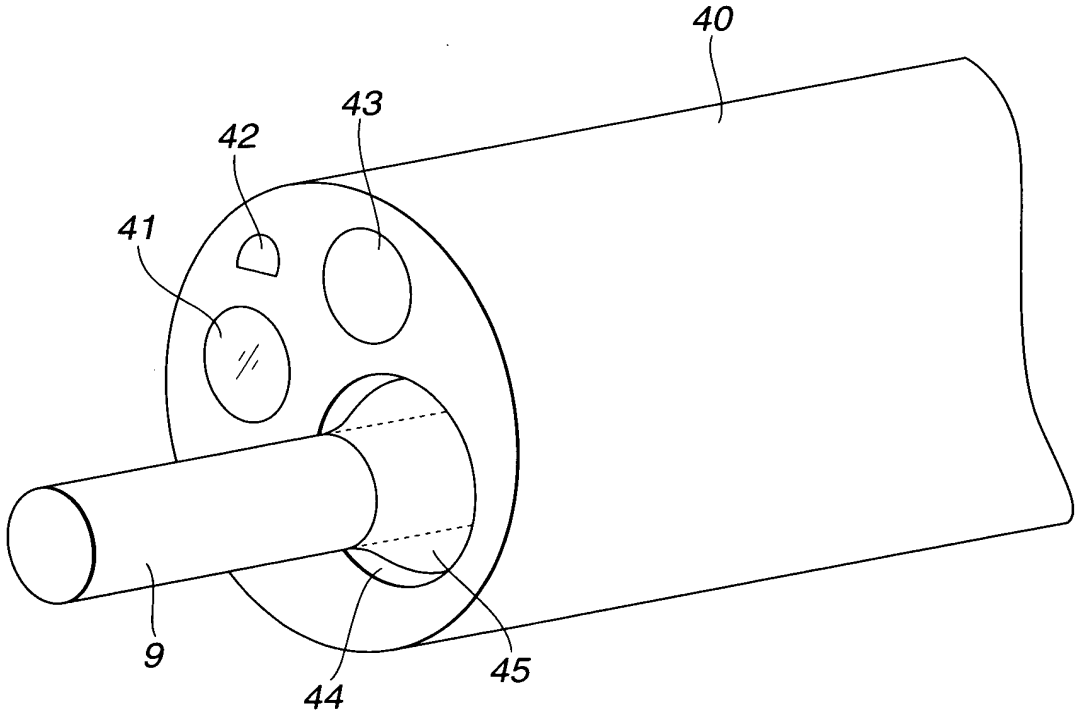


FIG.45

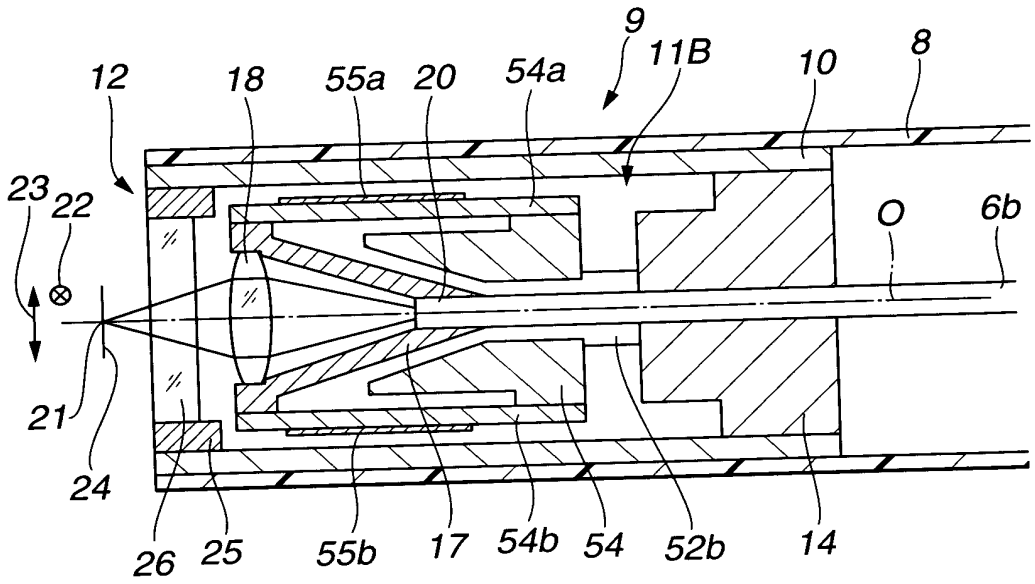

9
11B
12
18
55a
20
54a
10
8
23
22
O
6b
21
24
26
25
55b
17
54b
54
52b
14

FIG.46

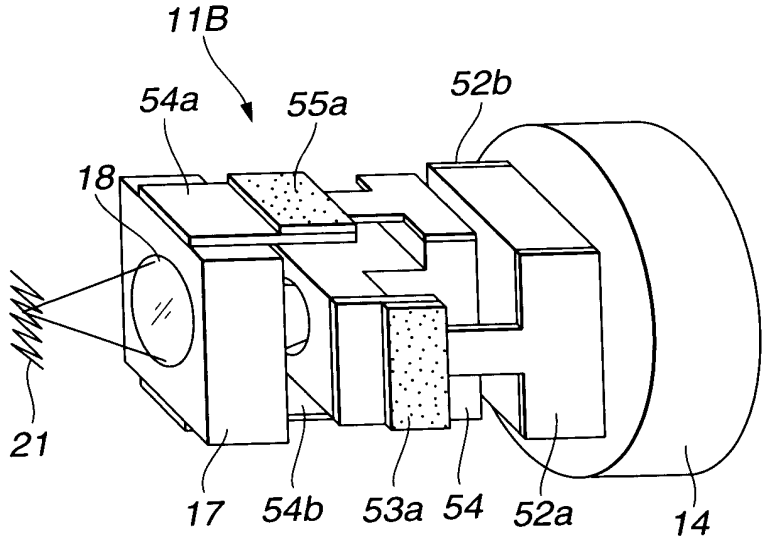

11B
54a
55a
52b
18
21
17
54b
53a
54
52a
14

FIG.47

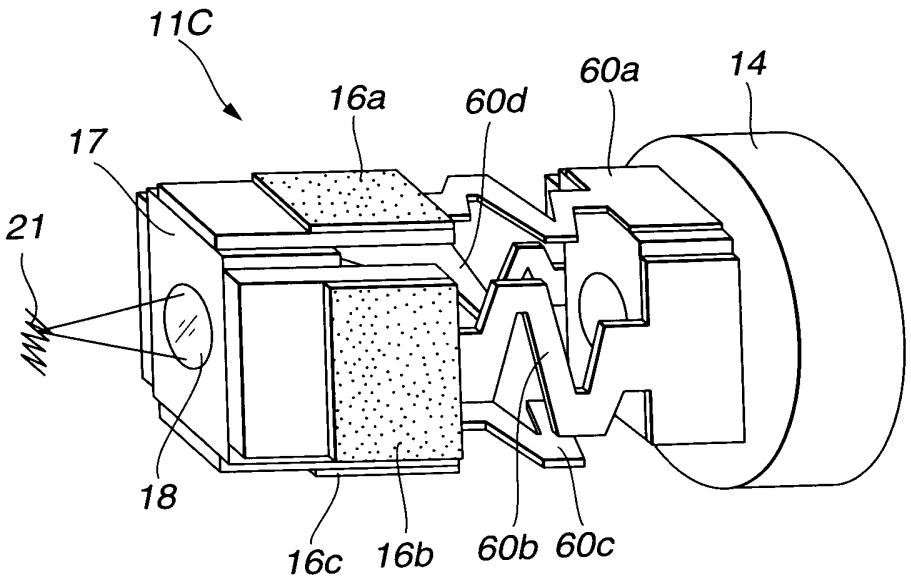

11C
16a
60d
60a
14
17
21
18
16c
16b
60b
60c

FIG.49

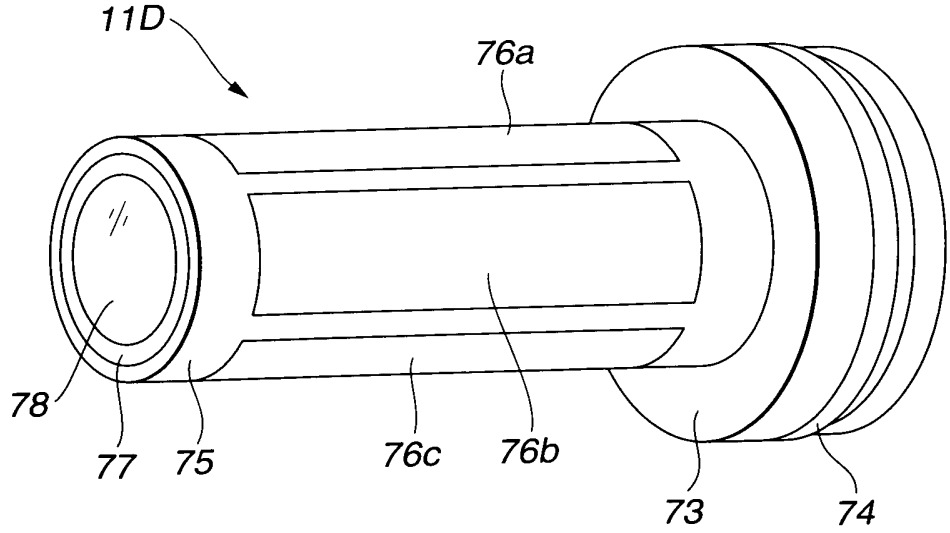

11D
76a
78
77
75
76c
76b
73
74

FIG.48

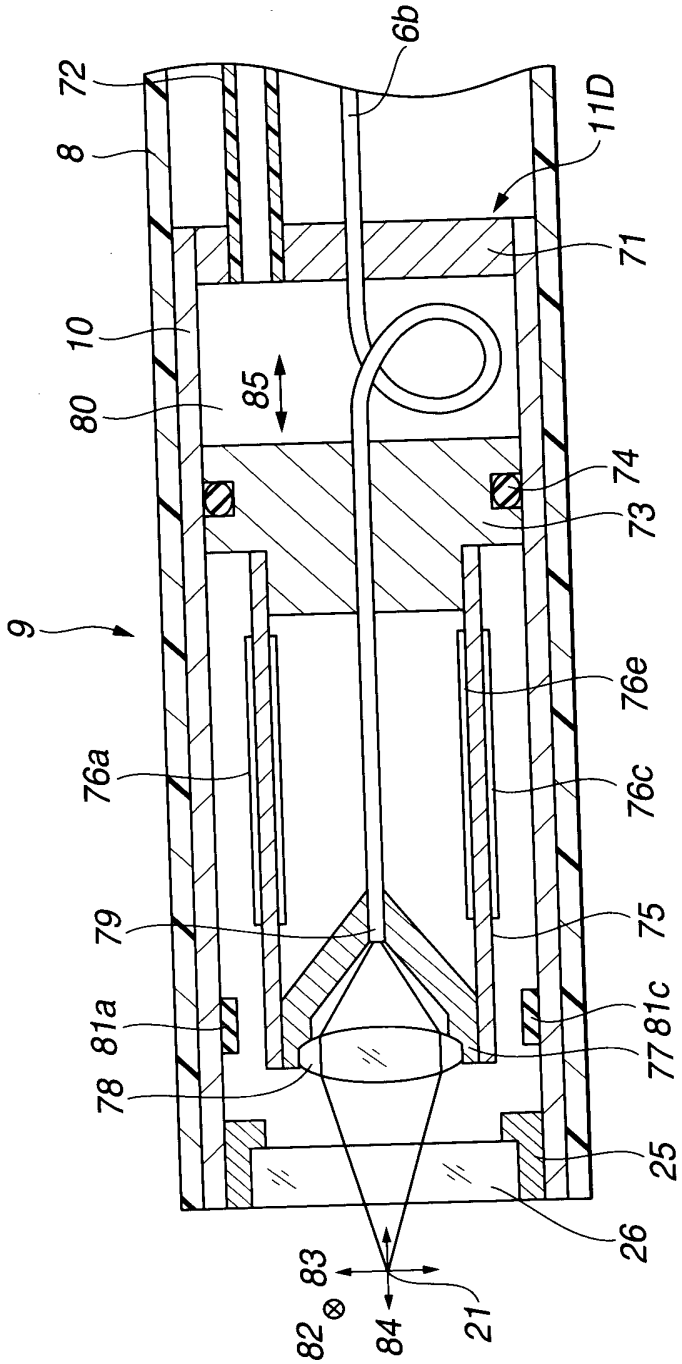

6b
72
8
11D
71
10
85
80
74
73
9
76e
76a
76c
79
75
81a
81c
78
77
25
26
83
82
84
21

FIG.50

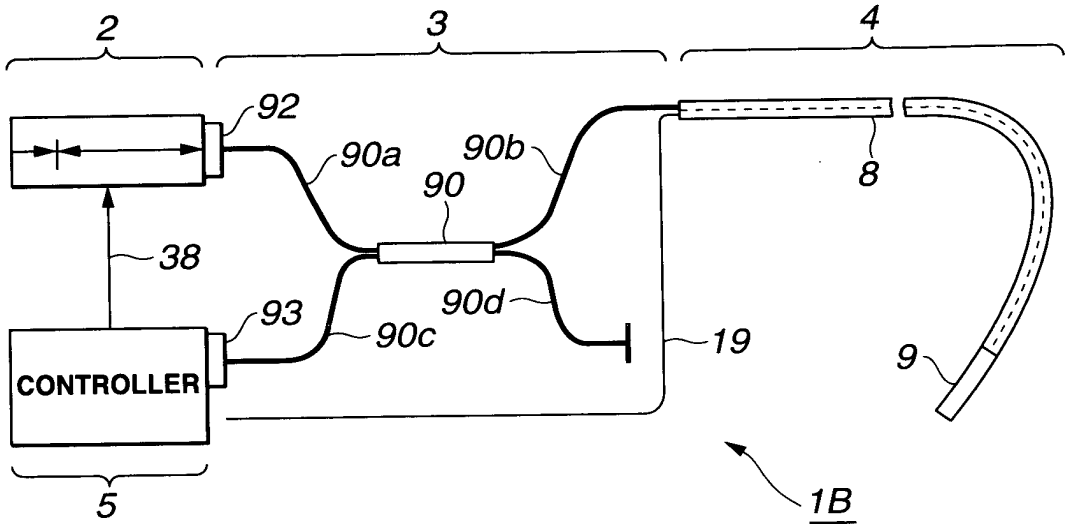

2
3
4
92
90a
90b
90
8
38
93
90d
90c
19
9
CONTROLLER
5
1B

FIG.53

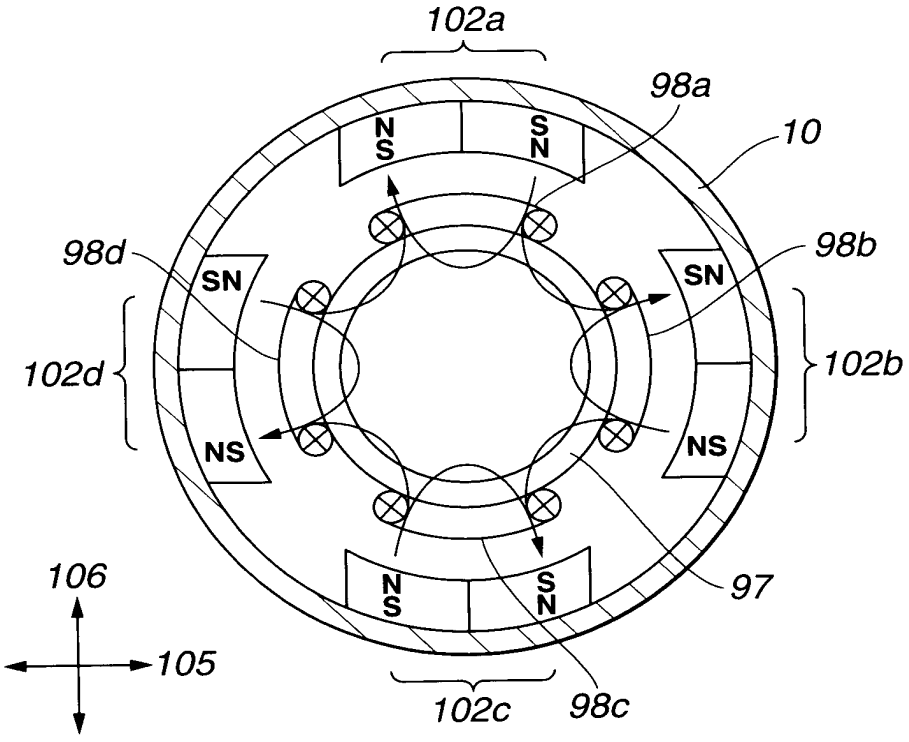

102a
98a
10
N
S
S
N
98d
98b
SN
SN
102d
102b
NS
NS
N
S
S
N
97
106
105
102c
98c

FIG.51

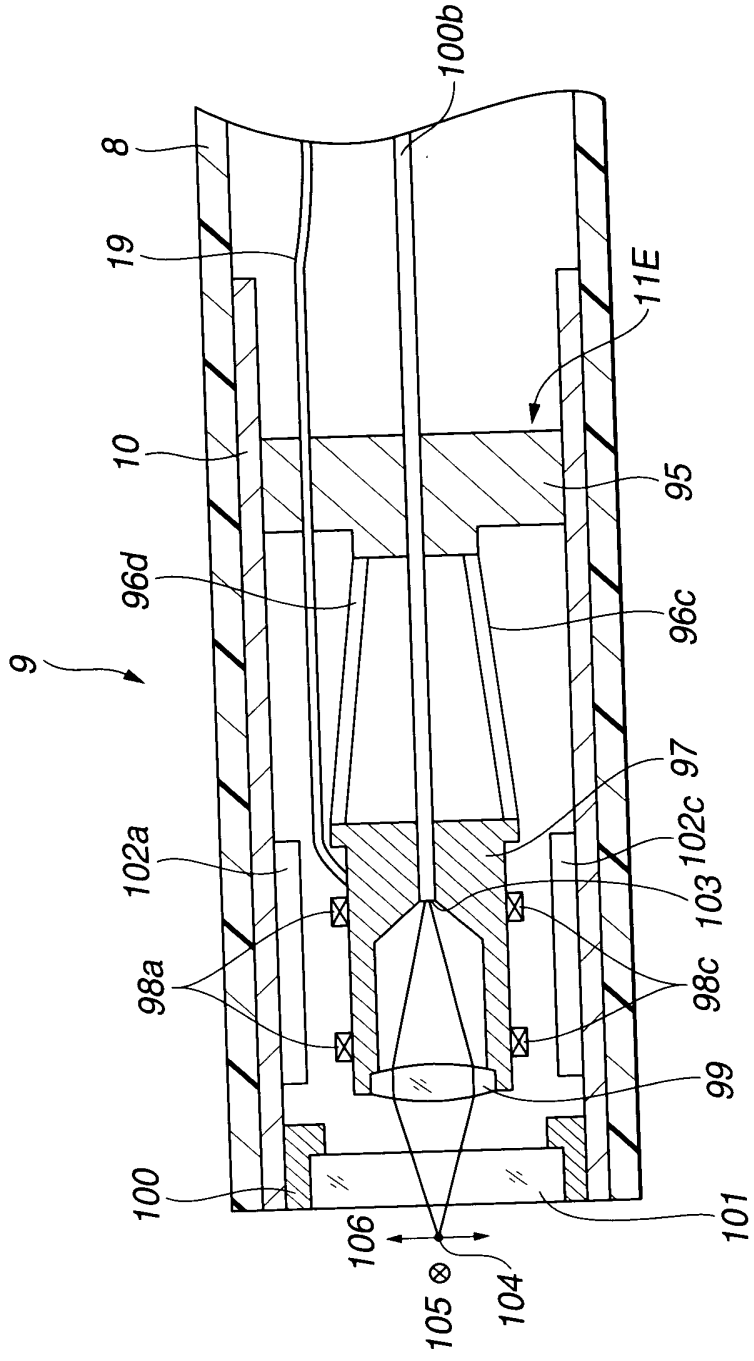

100b
8
19
11E
10
95
96d
96c
9
97
102a
102c
103
98a
98c
99
100
101
106
105
104

FIG.52

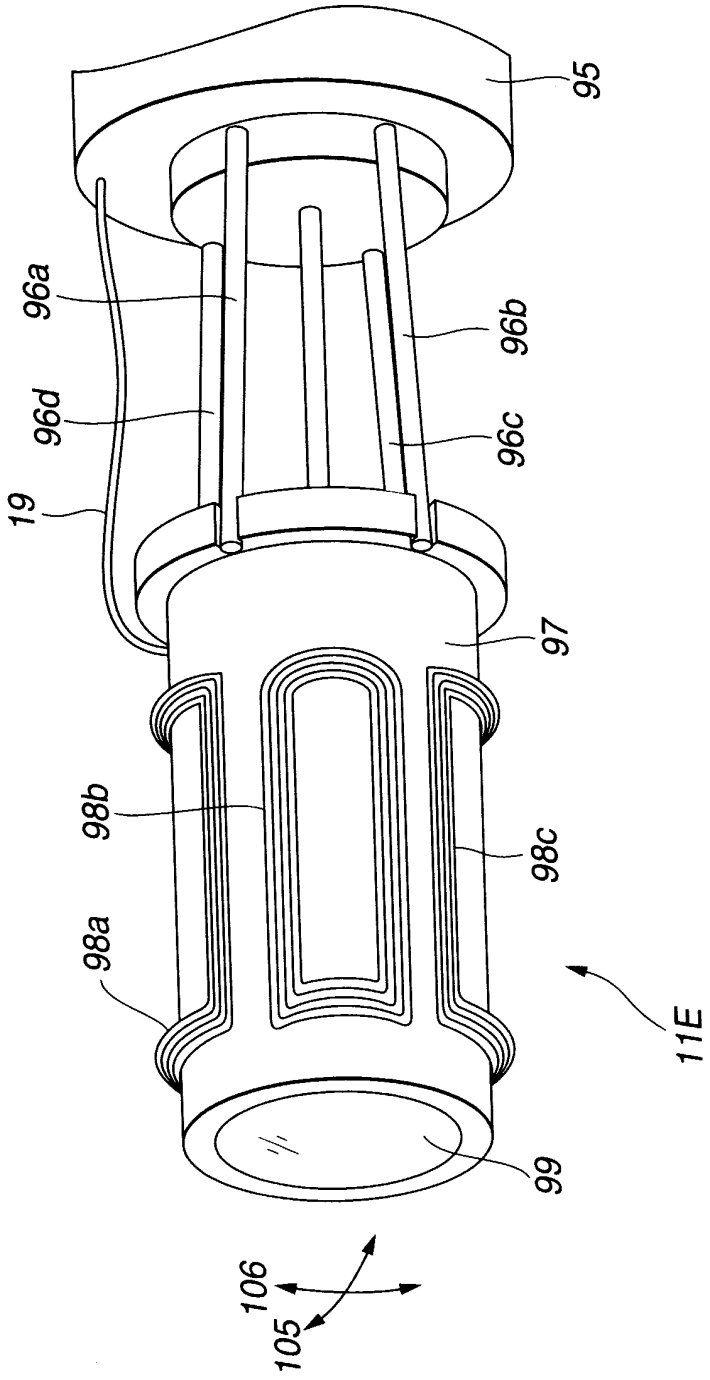


FIG.54A

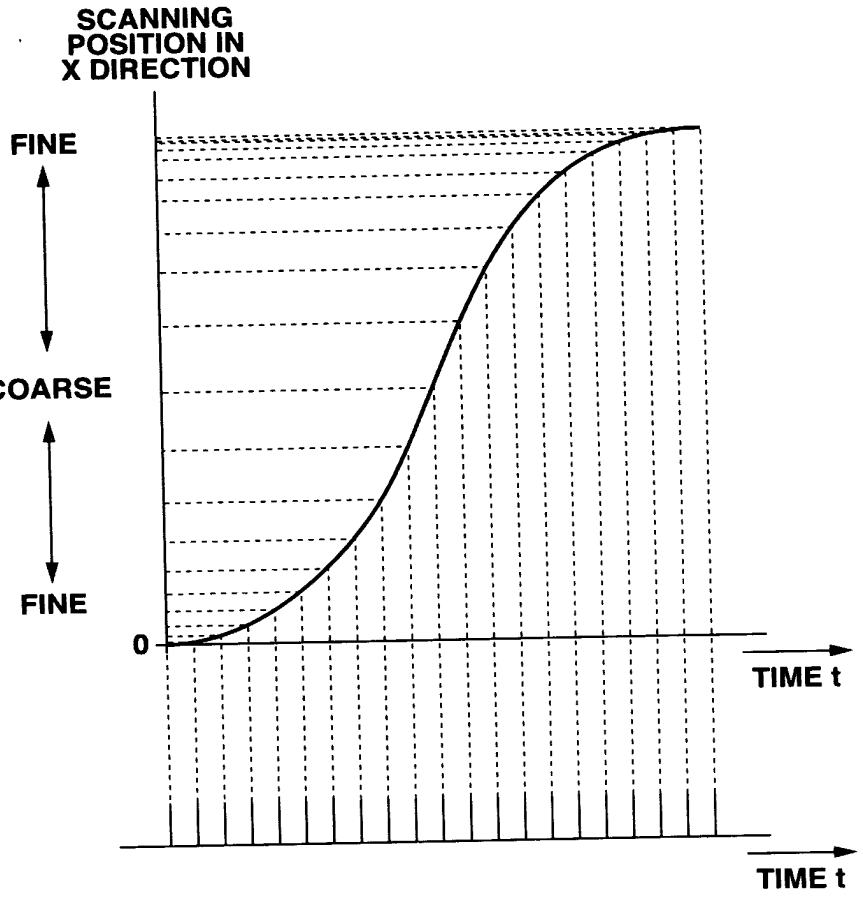


FIG.54B

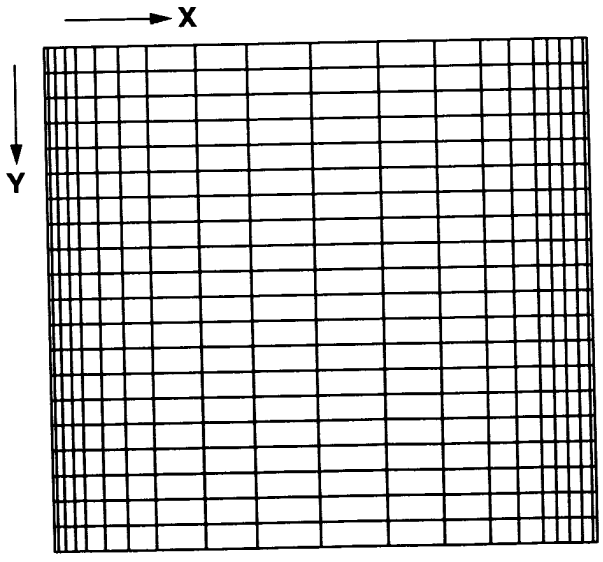


FIG.54C